United Nations Framework Convention on Climate Change

CLEAN DEVELOPMENT MECHANISM

CDM METHODOLOGY BOOKLET

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In producing this booklet, the UNFCCC benefited from the suggestions of Secretariat staff and thoughtful comments from several experts on the content that would be most helpful to people wishing to find and understand the methodologies of interest to them. In order to enhance its utility and respond to the needs of stakeholders we will seek to improve it. The Secretariat therefore welcomes comments and suggestions, which can be emailed to: CDM-info@unfccc.int.

This booklet will also be updated regularly in order to reflect changes in approved methodologies and tools. The latest version of the booklet is available on the UNFCCC website. It is also possible to contact the UNFCCC Secretariat and request CDs of the booklet.

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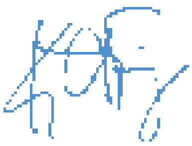
FOREWORD

Environmental integrity is at the heart of the CDM and methodologies have a major role in ensuring this integrity. Methodologies are required to establish a project's emissions baseline, or expected emissions without the project, and to monitor the actual ongoing emissions once a project is implemented. The difference between the baseline and actual emissions determines what a project is eligible to earn in the form of credits. Methodologies are essential when quantifying emission reductions in an uncapped environment on a project-by-project basis.

The function of methodologies is easy to grasp, but the methodologies themselves can be quite complex. They are necessarily diverse in their composition and application in order to accommodate the wide range of activities and locales covered by the CDM. Hence this publication, designed to guide users through the complex world of CDM methodologies.

By clearly summarizing, classifying and illustrating the methodologies available under the CDM, and then enhancing the means by which to search those methodologies, this publication serves to guide potential CDM project participants. It is my fervent hope, and that of the team that developed this work, that it will contribute to a rise in the number of CDM projects, increase the use of methodologies that directly benefit women and children, and enhance the regional distribution of projects, which is a key desire of Parties to the Kyoto Protocol, the CDM Executive Board and this secretariat.



Christiana Figueres, *Executive Secretary*
United Nations Framework Convention on Climate Change

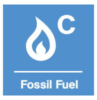
ABBREVIATIONS USED IN THIS BOOKLET

%	Percent
°C	Degree Celsius
A/R	Afforestation/ Reforestation
ACM	Approved Consolidated Methodology
AL	Aluminium
AM	Approved Methodology
AMS	Approved Methodology for Small-scale CDM project activities
AOR	Ammonia Oxidation Reactor
BRT	Bus Rapid Transit
BSG	Baseline Sample Group
$CACO_3$	Calcium Carbonate
CCHP	Trigeneration (Combined Cooling, Heating and Power generation)
CDD	Cooling Degree Days
CDM	Clean Development Mechanism
CDR	Carbon Dioxide Recovery
CER	Certified Emission Reduction
$(CF_3CF_2C(0)CF(CF_3)_2$	Perfluoro-2-methyl-3-pentanone
CFC	Chlorofluorocarbons
CFL	Compact Fluorescent Lamps
CH_4	Methane
CHP	Cogeneration (Combined Heat and Power generation)
CM	Combined Margin
CNG	Compressed Natural Gas
CO_2	Carbon Dioxide
COD	Chemical Oxygen Demand
COG	Coke Oven Gas
COP	Coefficient of Performance
CWPB	Centre Worked Pre-Baked
DC	Direct Cool
DME	Dimethyl ether
DMI	Dry Matter Intake
DOE	Designated Operational Entity
DOM	Dead Organic Matter
DRI	Direct Reduced Iron
DSS	Decision Support System
EB	Executive Board
FF	Frost Free
GHG	Greenhouse Gas
GIEE	Gas Insulated Electrical Equipment
GIS	Geographic Information System
GWh	Gigawatthours
GWP	Global Warming Potential
HDD	Heating Degree Days
HDPE	High Density Polyethylene
HFC	Hydrofluorocarbon
HPO (process)	Hydroylamin-Phosphat-Oxim (process)
HRSG	Heat Recovery Steam Generator

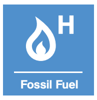
HSS	Horizontal Stud Soederberg
IAI	International Aluminium Institute
ICL	Incandescent Lamps
IEC	International Electronic Commission
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organization for Standardization
kg	Kilogramme
km	Kilometre
kV	Kilovolt
LCD	Liquid Crystal Display
LDPE	Low Density Polyethylene
LFG	Landfill gas
LNG	Liquefied Natural Gas
LPG	Liquefied Petroleum Gas
LSC	Large Scale
m	Metre
m^2	Square metre
m^3	Cubic metre
$MgCO_3$	Magnesium Carbonate
MRG	Methane Rich Gas
MSW	Municipal Solid Waste
MW	Megawatt
N_2O	Nitrous Oxide
ODP	Ozone Depleting Potential
PDD	Project Design Document
PFC	Perfluorocarbon
PFPB	Point Feeder Pre-Baked
PoA	Programme of Activities
PSG	Project Sample Group
P-U	Power-Voltage (characteristic curve)
PUF	Polyurethane Foam
PV	Photovoltaic
RDF	Refuse-Derived Fuel
RHF	Rotary Hearth Furnace
SB	Stabilized Biomass
SF_6	Sulphur Hexafluoride
SiMn	Silicomanganese
SO_2	Sulphur Dioxide
SOC	Soil Organic Carbon
SSC	Small-scale
SWDS	Solid Waste Disposal Site
SWPB	Side Worked Pre-Baked
VAM	Ventilation Air Methane
VSS	Vertical Stud Soederberg
W	Watt

ICONS USED IN THIS BOOKLET

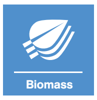
Fossil fuel
Any kind of fossil fuel used for combustion. Can be gaseous, liquid or solid. E.g. natural gas, fuel oil, coal.



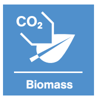
Carbon-intensive fossil fuel
Any kind of carbon-intensive fossil fuel used for combustion. E.g. fuel oil, coal.



Less-carbon-intensive fossil fuel
Any kind of less-carbon-intensive fossil fuel used for combustion. E.g. natural gas.



Biomass
Unless stated otherwise, renewable biomass is implied. Type of biomass include residues, plant oil, wood.



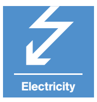
Fixation of CO_2 in Biomass
Fixation of atmospheric CO_2 from the atmosphere in biomass through the process of photosynthesis

Water
Any kind of water. E.g. drinking water, waste water.

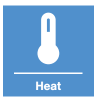
Oil
Oil of fossil origin. E.g. crude oil.

Gas
Any kind of combustible gas. E.g. natural gas, methane, biogas, landfill gas.

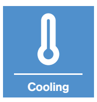
Energy
Any kind of energy. This icon is used, if different types of energy are depicted. E.g. electricity, heat, steam or mechanical energy.



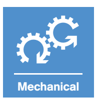
Electricity



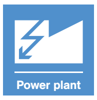
Heat
Any kind of thermal energy. E.g. steam, hot air, hot water.



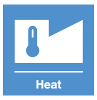
Cooling



Mechanical energy

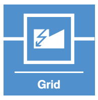


Power plant
Any kind of plant, facility or equipment used to produce electricity. This includes fossil-fuel-fired power plants, renewable power plants such as hydro power plants, but also (small) photovoltaic systems.

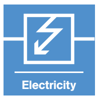


Heat generation
Any kind of plant, facility or equipment used to generate heat. This includes fossil-fuel-fired boilers to generate steam, incinerators, but also small applications such as radiators, cookers and ovens.

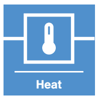
Energy generation
Any kind of plant, facility or equipment used to generate energy. This icon represents any co- or tri-generation system as well as systems to provide mechanical energy. The icon is also used, if either electricity or heat are produced.



Electricity grid
This icon is used to depict all (fossil-fuel-fired) power plants connected and providing electricity to the grid (e.g. national or regional grid).

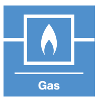


Electricity distribution grid
This icon is used to depict an electricity distribution system and is used when generated electricity is/ has to be supplied to the electricity grid or if the project activity occurs directly within the electricity distribution system.



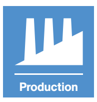
Heat distribution system
Any kind of heat distribution system. E.g. steam system, district heating system.

Energy distribution system
Any kind of energy distribution system. E.g. electricity grid or heat distribution system.



Gas distribution system
Any kind of gas distribution system. E.g. natural gas pipeline system.

Exploitation
Any kind of exploitation activity such as mining activities, oil and gas production.

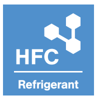


Production
The output of the production can be specified in the icon caption. E.g. aluminium, iron, cement, refrigerators.

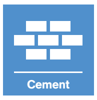
Air

ICONS USED IN THIS BOOKLET

Input or output material
Any kind of material. Can be gaseous, liquid or solid. E.g. raw materials, substances used for production, products such as plastics. This icon is also used if a GHG such as CO_2 is used as feedstock.



Refrigerant
Refrigerant that contains HFC.

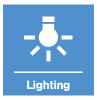


Cement
Products such as clinker, cement or bricks.

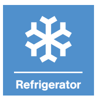
Waste
Any kind of waste. Can be gaseous, liquid or solid. The specific substance can be specified in the icon caption.

Manure
Manure from livestock.

Technology
Any kind of technology, equipment, appliance.



Lighting
Any kind of lighting equipment such as incandescent light bulbs, compact florescent lamps.



Refrigerators and chillers
Any kind of refrigerator or chiller.

Drinking water

Upgrade
Any type of upgrade. Can be retrofitting of existing equipment or installation of more-advanced technology to displace existing less-advanced equipment. E.g. replacement of incandescent light bulbs by compact fluorescent lamps. Also applicable to upgrade agricultural activity processes.

Burning
Uncontrolled burning of biomass, flaring or venting of waste gas.

Controlled burning
Any kind of combustion or decomposition in a controlled manner to dispose combustible substances. Also combustion to produce feedstock such as CO_2. or heat.

Catalysis
Catalysis of substances (i.e. GHGs) in order to convert them into substances with less or no GWP.

Losses
Any kind of losses from leaks in pipe systems and other distribution systems.

Release
Any kind of release of substances or energy without using the substance or the energy content of the substances.

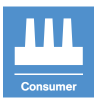
Disposal
Any kind of disposal. E.g. landfilling.

Treatment
Any kind of treatment of waste or materials, e.g. production of RDF from municipal waste.

Treatment
Any kind of treatment of wastewater or manure, e.g. lagoons, pits, aerobic treatment systems.

Greenhouse gas emissions
Emissions of greenhouse gases, i.e.:
Carbon dioxide (CO_2)
Methane (CH_4)
Nitrous oxide (N_2O)
Hydrofluorocarbons (HFCs)
Perfluorocarbons (PFCs)
Sulphur hexafluoride (SF_6). Where applicalbe, the specific GHG is presented in the icon caption.

Residential Consumer
Residential consumer, e.g. households.



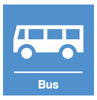
Commercial Consumer
Commercial consumer, e.g. industrial or institutional consumer.

Consumer
Residential or commercial consumer.

ICONS USED IN THIS BOOKLET

Buildings
Any kind of building.

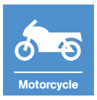
Train
Any kind of train-based transport.



Bus
Any kind of bus-based transport.

Truck
Any kind of truck-based transport.

Car
Any kind of car-based transport.



Motorcycle
Any kind of motorcycle-based transport.

Ship
Any kind of transport based on ships or barges.

Degraded land
Degraded land, e.g. with cracks (not roots), no vegetation on top. This symbol can be grouped with any of the land covers below to depict a combination (e.g. "degraded grassland" by showing both "land" and "grassland")

Grassland
Grass on ground without cracks.

Wetland
Lands with wet to moist soil, e.g. swamp or peatland.

Shrub and/or single tree vegetation
Non-forest woody vegetation: shrubs and single trees on "solid" ground (without cracks).

Afforestation/reforestation areas
Small afforestation/reforestation areas.

Settlement land
Land within settlements (parks, lawns, etc.) or along infrastructure (roads, powerlines, railways, waterways, etc.).

Sand dunes or barren land
Sand dunes or barren land without vegetation.

Agricultural land
Land with crops on solid ground. Also plantations.

Contaminated land
May indicate chemically polluted land (e.g. mine spoils) or naturally hostile land (e.g. naturally occurring salinity or alkalinity). The specific type is shown in the icon caption.

Planting or seeding
Afforestation/reforestation activity by planting, seeding or other measures.

Harvesting
Harvesting activity.

Fuelwood collection

Charcoal production
Charcoal production activity.

Livestock
Any kind of livestock.

Animal grazing

Agricultural activity
Animal feed collection activity.

Women and children
Methodologies that have a particular potential to directly improve the lives of women and children effected by the project.

Chapter I

INTRODUCTION

BASELINE AND MONITORING METHODOLOGIES

The Clean Development Mechanism (CDM) requires application of a baseline and monitoring methodology in order to determine the amount of Certified Emission Reductions (CERs) generated by a mitigation project in a project host country. Methodologies are classified into four categories:

- Methodologies for large scale CDM project activities;
- Methodologies for small scale CDM project activities;
- Methodologies for large scale afforestation and reforestation (A/R) CDM project activities;
- Methodologies for small scale A/R CDM project activities.

PURPOSE OF THE BOOKLET

This booklet provides concise summaries of approved CDM methodologies. It is arranged to assist CDM project developers in identifying methodologies that are suitable for their projects. The intention of producing the booklet is to achieve the objective of the CDM Executive Board (EB) to raise awareness of CDM methodologies.[1]

USE OF THE BOOKLET

The booklet is intended for use by varied audiences interested in the CDM and in particular potential CDM project developers who already have an idea of the mitigation projects they intend to implement. It facilitates the initial selection of potentially applicable methodologies. However, it cannot provide detailed guidance on specific elements of each methodology nor replace the approved methodologies. Therefore, the project developers should refer to the original methodologies available on the UNFCCC website.

CONTENT OF THE BOOKLET

Each methodology summary sheet provides the following information:

- Typical project(s) to which the methodology is applicable;
- Type(s) of greenhouse gas (GHG) emission mitigation action;
- Important conditions for application of the methodology;
- Key parameters that need to be determined or monitored;
- Visual description of baseline and project scenarios.

HOW TO FIND A SUITABLE METHODOLOGY

1. CATEGORIZATION BY MITIGATION ACTIVITY TYPE

This way of looking up methodologies is according to the relevant sectoral scopes and type of mitigation activities such as renewable energy, low carbon electricity generation, energy efficiency measures, fuel and feedstock switch, GHG destruction, GHG emission avoidance, displacement of a more-GHG-intensive output and GHG removal by sinks. Project developers knowing the type of mitigation activity to be implemented in their projects can thus easily identify potentially suitable methodologies.

2. CATEGORIZATION BY APPLIED TECHNOLOGY TYPE/MEASURE

This second way of looking up methodologies focuses on the technology applied in the project. The categorization by technology type enables project developers to identify a set of comparable methodologies applicable to the technology that is going to be implemented in their projects.

[1] See paragraph 12 <http://unfccc.int/resource/docs/2009/cmp5/eng/16.pdf>.

AFTER FINDING POTENTIALLY SUITABLE METHODOLOGIES

After identifying potentially applicable methodologies, users should access the methodologies, which are available on the UNFCCC website. It is also advisable to look at information about existing projects that have already applied the methodologies, which is also available through this website.

If there is no approved methodology applicable, then one can propose a new methodology or request a revision of an approved methodology or tool. In general, the new methodology option should be pursued if a project requires methodological approaches substantially different from an approved methodology. The revision option is suitable if an approved methodology is not applicable to a project but the project is broadly similar to the project to which the approved methodology is applicable. For cases where an approved methodology is applicable to a project but the project requires minor changes in the methodology application due to the project-specific circumstances, requesting a deviation of an approved methodology could be considered.

If an approved methodology is unclear or ambiguous in its methodological procedures, a request for clarification may be submitted.[2]

WOMEN AND CHILDREN ICON

The dual goals of the CDM are to promote sustainable development and reduce GHG emissions. The outcomes of a CDM project should therefore directly or indirectly improve the living conditions of all people. What has been highlighted in the booklet is that some methodologies have a particular potential to directly improve the lives of women and children effected by the project.

The criteria used to label these methodologies as having particular benefits for women and children are the potential to:

- increase access to affordable household fittings and appliances (e.g. light globes, refrigerators);
- optimize tasks typically undertaken by women or children (e.g. fuel wood gathering, cooking, water collection);
- improve the living environment of women and children (e.g. better air quality, heating, lighting); or
- utilize community-based participatory approaches, that give women and children an opportunity to learn about the projects and contribute to decision making processes.

In the case of A/R CDM activities this icon is also indicated for projects that generate new local employment opportunities because these positions are often filled by women.

It is important to note that a methodology that has not been labelled with this icon will not impact adversely on women and children.

USEFUL LINKS

UNFCCC CDM website
<https://cdm.unfccc.int/>

CDM methodologies
<https://cdm.unfccc.int/methodologies/index.html>

CDM projects
<https://cdm.unfccc.int/Projects/index.html>

CDM programmes of activities (PoA)
<https://cdm.unfccc.int/ProgrammeOfActivities/index.html>

CDM sectoral scopes
<https://cdm.unfccc.int/DOE/scopes.html#11>

UNEP Risø CDM pipeline analysis and database
<http://cdmpipeline.org/>

[2] See <https://cdm.unfccc.int/Reference/Procedures/index.html>.

1.1. CDM PROJECT CYCLE AND INSTITUTIONS

A CDM project must be registered by the CDM EB. The project's compliance with the CDM rules is assessed on the basis of the Project Design Document (PDD). The central elements of a PDD are:

- the assessment and demonstration of additionality;
- the identification of the baseline and the estimation of emission reductions;
- the monitoring plan; and
- the presentation of the public stakeholder consultation.

The validation is the independent assessment of the project's compliance with all CDM rules by a Designated Operational Entity (DOE).

If the DOE determines that the requirements for a CDM project have been met then they request the registration of the project by the CDM EB. Registration constitutes final approval of a CDM project. This will be followed by certification/verification by the DOE and CERs issued by the EB. For an overview of the entire project cycle see <https://cdm.unfccc.int/Projects/pac/index.html>.

Finding applicable methodologies – two categorization approaches

There are two ways the booklet categorizes methodologies. The first approach – the methodology categorization table – is based on the sectoral scopes defined by the UNFCCC (see <https://cdm.unfccc.int/DOE/scopes.html>). This table allocates the methodology to generic mitigation activity types. This approach is useful for project developers who have not yet made a technology choice or CDM stakeholders who are interested in a type of mitigation activity.

The second approach is based on at the specific technologies adopted by project developers. It structures methodologies according to technology and the history of methodology development that has led to several "families" of methodologies all relating to a specific technology. It is appropriate for project developers who have already decided on a particular technology for their project.

1.2. CATEGORIZATION BY MITIGATION ACTIVITY TYPE (METHODOLOGY CATEGORIZATION TABLE)

In addition to the methodology sectoral scopes[3], methodologies in this table are also categorized by the type of mitigation activity, these being renewable energy, low carbon electricity generation, energy efficiency measures, fuel switch, GHG destruction, GHG emission avoidance and GHG removal by sinks.

Sectoral scopes 1 to 3 (energy sectors – generation, supply and consumption) are first distinguished according to:

- Electricity generation and supply;
- Energy for industries;
- Energy (fuel) for transport;
- Energy for households and buildings.

And then categorized in terms of type of mitigation activity:

- Displacement of a more-GHG-intensive output:
  i. Renewable energy
  ii. Low carbon electricity
- Energy efficiency;
- Fuel and feedstock switch.

Sectoral scopes 4 to 15 (other sectors) are categorized according to these mitigation activities:

- Displacement of a more-GHG-intensive output.
- Renewable energy;
- Energy efficiency;
- GHG destruction;
- GHG emission avoidance;
- Fuel switch;
- GHG removal by sinks.

DESCRIPTION OF TYPES OF MITIGATION ACTIVITIES

DISPLACEMENT OF A MORE-GHG-INTENSIVE OUTPUT

This category refers to project activities where the consumption of a more-GHG-intensive output is displaced with the output of the project. The category is separately defined because of the importance of not just implementing the project activity, but also ensuring that the more-GHG-intensive output is displaced by the output of the project activity.

All renewable energy generation and low carbon energy generation project activities are part of this category. Many other methodologies are also allocated to this category depending upon how the emission reductions are calculated in the corresponding methodologies.

Examples:

- Power generation from waste energy recovery and supply to a recipient who was receiving more-GHG-intensive power.
- Power generation using renewable or low carbon energy sources and export of power to a grid with combined margin emission factor of more than zero and/or to a recipient using fossil fuel based power in the absence of project activity.

[3] The Methodology categorization table allocates the methodology to the sectoral scope(s) that have been formally defined for it, which are primarily used as the basis of DOE accreditation. However, if there are additional sectoral scopes that are also applicable to the methodology, then the methodology is also shown in these sectors in the table. This is to make it potentially easier to look up the methodology.

RENEWABLE ENERGY

This category includes the use of various renewable energy sources.

Examples:

- Hydro power plant;
- Wind power plant;
- Solar cooker;
- Biomass-fired boiler.

LOW CARBON ELECTRICITY

This encompasses mainly greenfield electricity generation based on less carbon intensive fuel such as natural gas. As no power plant exists at the project location before implementation of the project, the mitigation activity is not fuel switch. At the same time the applied technology might not be best available technology, differentiating it from energy efficiency measures. A typical low carbon electricity project is the construction of a greenfield natural-gas-fired power plant.

ENERGY EFFICIENCY

The category energy efficiency includes all measures aiming to enhance the energy efficiency of a certain system. Due to the project activity, a specific output or service requires less energy consumption. Waste energy recovery is also included in this category.

Examples:

- Conversion of a single cycle to a combined cycle gas-fired power plant;
- Installation of a more efficient steam turbine;
- Use of highly efficient refrigerators or compact fluorescent lamps;
- Recovery of waste heat from flue gases;
- Recovery and use of waste gas in a production process.

FUEL OR FEEDSTOCK SWITCH

In general, fuel switch measures in this category will replace carbon-intensive fossil fuel with a less-carbon-intensive fossil fuel, whereas a switch from fossil fuel to renewable biomass is categorized as “renewable energy”. In case of a feedstock switch, no differentiation between fossil and renewable sources is applied.

Examples:

- Switch from coal to natural gas;
- Feedstock switch from fossil sources of CO_2 to renewable sources of CO_2;
- Use of different raw material to avoid GHG emissions;
- Use of a different refrigerant to avoid GHG emissions;
- Blending of cement in order to reduce demand for energy intensive clinker production.

GHG DESTRUCTION

The category GHG destruction covers activities that aim at the destruction of GHG. In many cases, the project includes capture or recovery of the GHG. The destruction is achieved by combustion or catalytic conversion of GHGs.

Examples:

- Combustion of methane (e.g. biogas or landfill gas);
- Catalytic N_2O destruction.

GHG EMISSION AVOIDANCE

This category includes various activities where the release of GHG emissions to the atmosphere is reduced or avoided.

Examples:

- Avoidance of anaerobic decay of biomass;
- Reduction of fertiliser use.

GHG REMOVAL BY SINKS

All A/R activities are allocated to this category. Through photosynthesis in plants, CO_2 from the atmosphere is removed and stored in form of biomass.

- Methodologies for large scale CDM project activities
- Methodologies for small scale CDM project activities
- Methodologies for small and large scale afforestation and reforestation (A/R) CDM project activities
- **AM0000** Methodologies that have a particular potential to directly improve the lives of women and children

Table VI-1. **Methodology Categorization in the Energy Sector**

Sectoral scope	Type	Electricity generation and supply	Energy for industries	Energy (fuel) for transport	Energy for households and buildings
1 Energy industries (renewable-/ non renewable sources)	Renewable energy	AM0007	AM0007	AM0089	AM0025
		AM0019	AM0025	ACM0017	AM0053
		AM0025	AM0036		AM0069
		AM0026	AM0053		AM0072
		AM0042	AM0069		AM0075
		AM0052	AM0075		AMS-I.A.
		AM0085	AM0089		AMS-I.B.
		ACM0002	ACM0006		AMS-I.C.
Displacement of a more-GHG-intensive output		ACM0006	AMS-I.C.		AMS-I.E.
		ACM0018	AMS-I.F.		AMS-I.F.
		AMS-I.A.	AMS-I.G.		AMS-I.G.
		AMS-I.C.	AMS-I.H.		AMS-I.H.
		AMS-I.D.			
		AMS-I.F.			
		AMS-I.G.			
		AMS-I.H.			
	Low carbon electricity	AM0029	AM0087		
		AM0074			
		AM0087			
	Energy efficiency	AM0014	AM0014		AM0058
		AM0024	AM0024		AM0084
		AM0048	AM0048		
		AM0049	AM0049		
		AM0061	AM0054		
		AM0062	AM0055		
		AM0076	AM0056		
		AM0084	AM0076		
		ACM0007	AM0084		
		ACM0012	ACM0012		
		ACM0013			
		AMS-II.B.			
		AMS-II.H.			
		AMS-III.AL.			
	Fuel/feedstock switch	AM0045	AM0014		AM0081
		AM0048	AM0048		
		AM0049	AM0049		
		ACM0011	AM0056		
		AMS-III.AG.	AM0069		
		AMS-III.AH.	AM0081		
		AMS-III.AM.	ACM0009		
			AMS-III.AM.		

Table VI-1. **Methodology Categorization in the Energy Sector** (continued)

Sectoral scope	Type	Electricity generation and supply	Energy for industries	Energy (fuel) for transport	Energy for households and buildings
2 Energy distribution	Renewable energy	**AM0045**	**AM0053**		
			AM0069		
			AM0075		
	Energy efficiency	**AM0045**			
		AM0067			
		AMS-II.A.			
	Fuel/feedstock switch	**AM0045**	**AM0077**		
3 Energy demand	Renewable energy				**AMS-III.AE.**
	Energy efficiency	**AMS-III.AL.**	**AM0020**		**AM0020**
			AM0044		**AM0044**
			AM0060		**AM0046**
			AM0068		**AM0060**
			AM0088		**AM0086**
			AM0017		**AMS-II.C.**
			AM0018		**AMS-II.E.**
			AMS-I.I.		**AMS-II.F.**
			AMS-II.C.		**AMS-II.G.**
			AMS-II.F.		**AMS-II.J.**
			AMS-II.G.		**AMS-II.K.**
					AMS-III.AE.
					AMS-III.X.
	Fuel/feedstock switch	**AMS-III.B.**	**AM0003**		**AMS-II.F.**
			ACM0005		**AMS-III.B.**
			AMS-II.F.		
			AMS-III.B.		

Table VI-2. **Methodology Categorization other Sectors**

Sectoral scope	Renewable energy	Energy Efficiency	GHG destruction	GHG formation avoidance	Fuel/Feedstock Switch	GHG removal by sinks	Displacement of a more-GHG-intensive output
4 Manufacturing industries	**AM0007**	**AM0014**	**AM0078**	**ACM0005**	**AM0014**		**AM0070**
	AM0036	**AM0024**	**AMS-III.K.**	**AM0041**	**AM0049**		**ACM0012**
	ACM0003	**AM0049**		**AM0057**	**ACM0003**		
	AMS-III.Z.	**AM0055**		**AM0065**	**ACM0005**		
		AM0070		**AMS-III.L.**	**ACM0009**		
		ACM0012			**ACM0015**		
		AMS-II.D.			**AMS-III.N.**		
		AMS-II.H.			**AMS-III.Z.**		
		AMS-II.I.			**AMS-III.AD.**		
		AMS-II.M.			**AMS-III.AM.**		
		AMS-III.P.					
		AMS-III.Q.					
		AMS-III.V.					
		AMS-III.Z.					

Table VI-2. **Methodology Categorization other Sectors** (continued)

Sectoral scope	Renewable energy	Energy Efficiency	GHG destruction	GHG formation avoidance	Fuel/Feedstock Switch	GHG removal by sinks	Displacement of a more-GHG-intensive output
5 Chemical industries	ACM0017 AM0053 AM0075 AM0089	AM0055 AMS-II.M. AMS-III.AC. AMS-III.AJ.	AM0021 AM0028 AM0034 AM0051	AMS-III.M. AMS-III.AI.	AM0027 AM0037 AM0050 AM0063 AM0069 AMS-III.J. AMS-III.O.		AM0055 AM0069 AM0081
6 Construction							
7 Transport	AMS-III.T. AMS-III.AK.	AM0031 AM0090 ACM0016 AMS-III.C. AMS-III.S. AMS-III.U. AMS-III.AA.			AMS-III.S.		
8 Mining/mineral production	ACM0003		ACM0008 AM0064 AMS-III.W.		ACM0005 ACM0015		
9 Metal production	AM0082	AM0038 AM0059 AM0066 AM0068 AMS-III.V.		AM0030 AM0059 AM0065	AM0082		
10 Fugitive emissions from fuel (solid, oil and gas)			AM0064 ACM0008 AMS-III.W.	AM0023 AM0043	AM0009 AM0037 AM0077	AM0074	AM0009 AM0077
11 Fugitive emissions from production and consumption of halocarbons and SF_6			AM0001 AM0078 AMS-III.X.	AM0035 AM0065 AM0079 AMS-III.X.	AM0071 AMS-III.AB.		
12 Solvent use							
13 Waste handling and disposal	AM0025	AMS-III.AJ.	AM0073 ACM0001 ACM0010 ACM0014 AMS-III.G. AMS-III.H. AMS-III.AF.	AM0025 AM0039 AM0057 AM0080 AM0083 AMS-III.E. AMS-III.F. AMS-III.I. AMS-III.Y.			

Table VI-2. **Methodology Categorization other Sectors** (continued)

Sectoral scope	Renewable energy	Energy Efficiency	GHG destruction	GHG formation avoidance	Fuel/Feedstock Switch	GHG removal by sinks	Displacement of a more-GHG-intensive output
14 Land-use, land-use change and forestry	AM0042					AR-AM0002 AR-AM0004 AR-AM0005 AR-AM0006 AR-AM0007 AR-AM0009 AR-AM0010 AR-AM0011 AR-ACM0001 AR-ACM0002 AR-AMS0001 AR-AMS0002 AR-AMS0003 AR-AMS0004 AR-AMS0005 AR-AMS0006 AR-AMS0007	
15 Agriculture			AM0073 ACM0010 AMS-III.D. AMS-III.R.	AMS-III.A.			

1.3. CATEGORIZATION BY APPLIED TECHNOLOGY TYPE/MEASURE (METHODOLOGY FAMILY TREES)

There has been distinct development phases of methodologies over time, leading to "families" when one methodology catalyzed the development of other methodologies.[4] The figures below show the families of methodologies in form of family trees. They are designed as follows: Each methodology is denoted by a box showing its unique identification number. Methodologies that can be found in the same family tree deal with comparable technologies or measures.

[4] The concept of methodology families and family trees was initially adopted in the following guidebook: Understanding CDM Methodologies: A guidebook to CDM Rules and Procedures, written by Axel Michaelowa, Frédéric Gagnon-Lebrun, Daisuke Hayashi, Luis Salgado Flores, Phlippe Crête and Mathias Krey, commissioned by the UK Department for Environment Food and Rural Affairs (© Crown Copyright 2007).

The guidebook can be downloaded at: <http://www.perspectives.cc/home/groups/7/Publications/CDM_Guidebook_Perspectives_DEFRA_122007.pdf>.

- Methodologies for large scale CDM project activities
- Methodologies for small scale CDM project activities
- Methodologies for small and large scale afforestation and reforestation (A/R) CDM project activities

AM0000 Methodologies that have a particular potential to directly improve the lives of women and children

Figure VII-1. **Methodologies for renewable electricity**

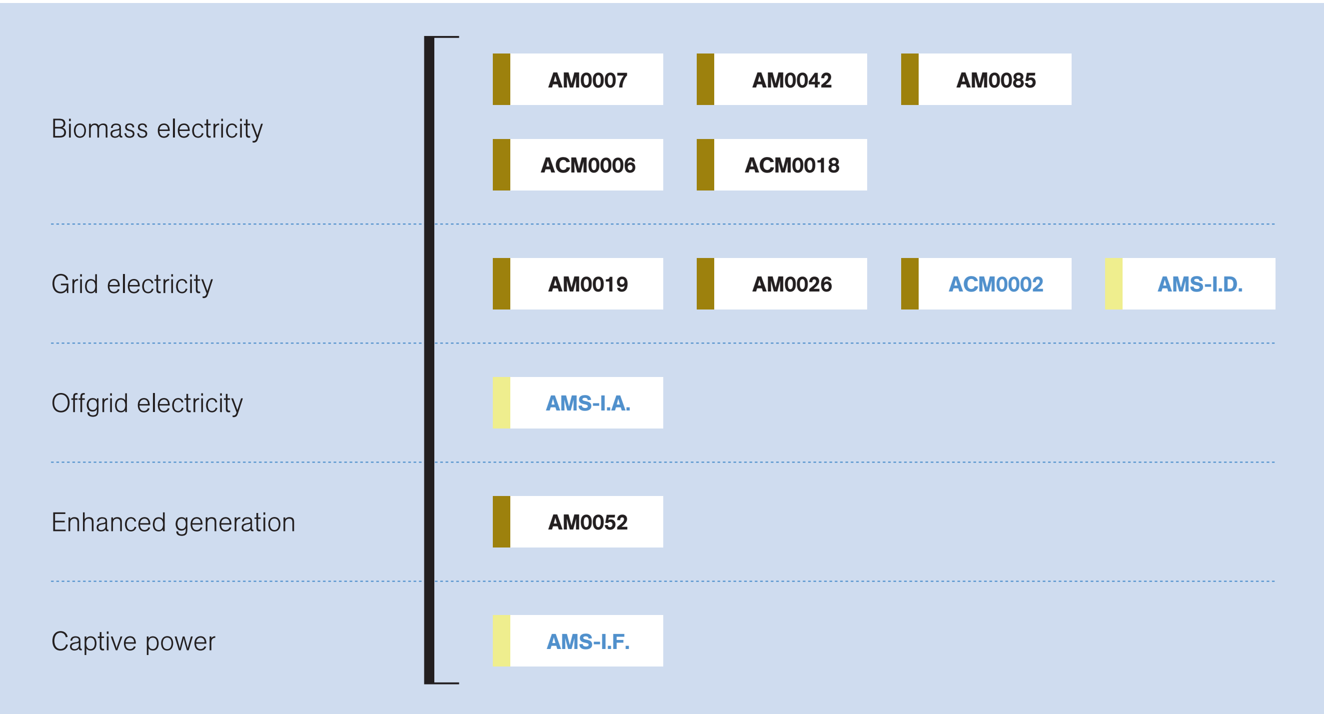


Figure VII-2. **Methodologies for renewable energy (thermal or mechanical energy)**

Renewable thermal energy	AM0036, AM0072, AM0075, AM0082, ACM0003, AMS-I.C., AMS-I.E.
Renewable mechanical energy	AMS-I.B.

Figure VII-3. **Methodologies for efficient or less-carbon-intensive fossil-fuel-fired power plants**

Co- or trigeneration	AM0014, AM0048, AM0049, AM0076, AM0084, AMS-II.H., AMS-II.K., AMS-III.AM.
Gas – newly built	AM0029, AM0087, ACM0013, AM0049
Fuel cell – newly built	AMS-III.AC.
Coal – newly built	ACM0013
Low carbon electricity	AM0074
Energy efficiency	AM0061, AM0062, ACM0007, AMS-II.B., AMS-III.AL.

Figure VII-4. **Methodologies for fuel switch**

Coal/oil to gas	ACM0009	ACM0011	AMS-II.F.	AMS-III.B.
	AMS-III.AG.	AMS-III.AH.	AMS-III.AM.	AMS-III.AN.
Other low-carbon fuels	AM0081	ACM0003	AMS-III.Z.	AMS-III.AM.
	AMS-III.AN.			

Figure VII-5. **Methodologies for biofuel**

Plant oil	AMS-I.G.	AMS-III.T.		
Biodiesel	AM0089	ACM0017	AMS-I.H.	AMS-III.AK.

Figure VII-6. **Methodologies for industrial energy efficiency**

Steam systems	AM0017	AM0018		
Water pumping	AM0020	AMS-II.C.		
Waste gas/energy recovery	AM0024	AM0055	AM0058	AM0066
	ACM0012	AMS-II.I.	AMS-III.P.	AMS-III.Q.
Metal	AM0038	AM0059	AM0066	
	AM0068	AMS-III.V.		
Boilers	AM0044	AM0054	AM0056	AMS-II.D.
Chillers	AM0060			
District heating	AM0058			
Agriculture	AMS-II.F.	AMS-III.A.		
Other/various technologies	AM0088	AMS-II.C.	AMS-II.D.	

Figure VII-7. **Methodologies for household & building energy efficiency**

Cookstove	AMS-II.C.	AMS-II.G.		
Water pumping	AMS-II.C.			
Water purifier	AM0086	AMS-II.C.		
Refrigerators/chillers	AM0060	AM0070	AMS-II.C.	AMS-III.X.
Lighting	AM0046	AMS-II.C.	AMS-II.J.	
Whole building	AMS-II.E.	AMS-III.AE.		
Other/various technologies	AMS-II.C.			

Figure VII-8. **Methodologies for gas flaring and gas leak reduction**

Oil production	AM0009	AM0037	AM0077
Compressors and distribution systems	AM0023		
Pipe replacement	AM0043		

Figure VII-9. **Methodologies for feedstock switch**

Cement	ACM0015			
Cement blending	ACM0005			
Inorganic	AM0027	AM0050		
Paper	AM0057	AMS-III.M.		
Plastic	AMS-III.AJ.			
Other industries	AM0063	AMS-III.J.	AMS-III.AD.	
Avoidance/decrease of usage	AMS-III.AI.			

Figure VII-10. **Methodologies for industrial gases**

HFC-23	AM0001			
Other HFCs	AM0071	AMS-III.N.	AMS-III.X.	AMS-III.AB.
N_2O, adipic acid	AM0021			
N_2O, nitric acid	AM0028	AM0034	AM0051	
PFC	AM0030	AM0059		
SF_6	AM0035	AM0065	AM0078	AM0079

Figure VII-11. **Methodologies for waste management and wastewater**

Alternative treatment – composting	AM0025	AM0039	AMS-III.F.	AMS-III.AF.
Alternative treatment – burning	AM0025	AMS-III.E.	AMS-III.L.	
	AMS-III.R.	AMS-III.Y.		
Alternative treatment – aerobic	AM0083			
Landfill gas	ACM0001	AMS-III.G.		
Lagoons and biodigester – biogas	ACM0014	AMS-III.F.	AMS-III.H.	
Manure and comparable animal waste	AM0073	ACM0010	AMS-III.D.	
Aerobic wastewater treatment	AM0080	AMS-III.I.		
Biogenic methane	AM0053	AM0069	AM0075	AMS-III.O.

Figure VII-12. **Methodologies for transport**

Bus systems	AM0031
Mass rapid transit systems	ACM0016, AMS-III.U.
Energy efficiency through retrofits	AMS-III.AA., AMS-III.C.
Fuel switch through retrofits	AMS-III.S.
Transportation of cargo	AM0090

Figure VII-13. **Other methodologies**

Methane from mining activities	AM0064, ACM0008, AMS-III.W.
Charcoal production	AM0041, AMS-III.K.
Electricity grid connection	AM0045
Efficient transmission and distribution	AM0067, AMS-II.A.
Afforestation and reforestation	AR-AM0002, AR-AM0004, AR-AM0005, AR-AM0006, AR-AM0007, AR-AM0009, AR-AM0010, AR-AM0011, AR-ACM0001, AR-ACM0002, AR-AMS0001, AR-AMS0002, AR-AMS0003, AR-AMS0004, AR-AMS0005, AR-AMS0006, AR-AMS0007

1.4. INTRODUCTION TO METHODOLOGY SUMMARY SHEETS

The methodology summaries are distinguished as being for large and small scale CDM project activities, large scale and small scale A/R CDM project activities, as described in the introduction. Each methodology summary sheet has the sections as follows:

TYPICAL PROJECT(S) APPLICABLE TO THE METHODOLOGY

Projects for which the methodology is applicable are described. Practical examples are mentioned for better understanding of the purpose of the specific methodology.

TYPE(S) OF GREENHOUSE GAS (GHG) EMISSION MITIGATION

This refers to the type of mitigation activity presented in the methodology categorization table (section 1.2. above). The type of mitigation action, such as fuel switch or energy efficiency is briefly described.

IMPORTANT CONDITIONS FOR APPLICATION OF THE METHODOLOGY

Methodologies are only applicable under particular conditions and the most relevant conditions are listed in this section. However, not all conditions can be listed and it is important to consult the full text of each methodology.

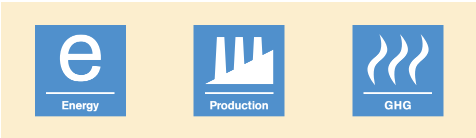
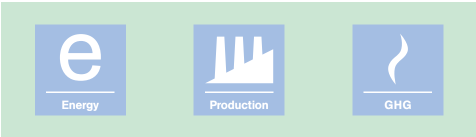
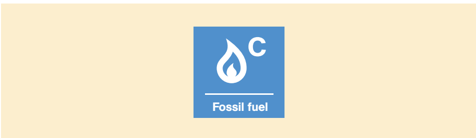
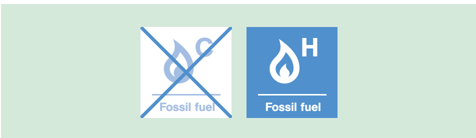
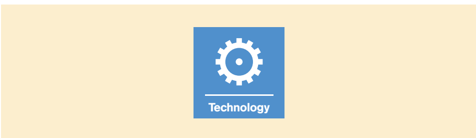
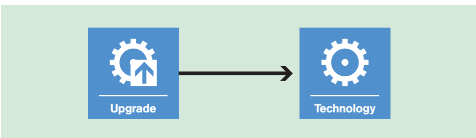
KEY PARAMETERS THAT NEED TO BE DETERMINED OR MONITORED

In order to calculate emission reductions of a project, certain parameters have to be determined at the project start when it is validated and various parameters have to be monitored during the operation of the project. Therefore this section is divided into parameters “at validation” and parameters “monitored”. In addition, some methodologies require checking of specific conditions or parameters to prove that applicability conditions are met.

VISUAL DESCRIPTION OF BASELINE AND PROJECT SCENARIOS

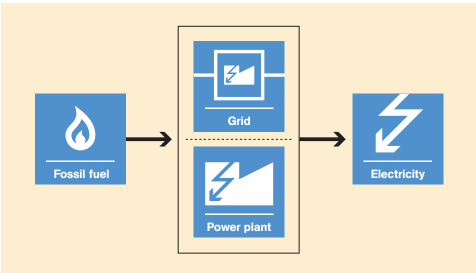
The baseline and project scenario are described with simplified diagrams. The baseline scenario represents the situation that would occur in the absence of the project. The project scenario refers to the situation that is achieved by implementation of the project. Complex scenarios cannot be displayed by a simplified diagram. Therefore, the simplified diagrams focus on the main activity that results in emission reductions. The diagrams do not replace the necessity to consult the full methodology text.

EXEMPLIFICATION OF DIAGRAMS

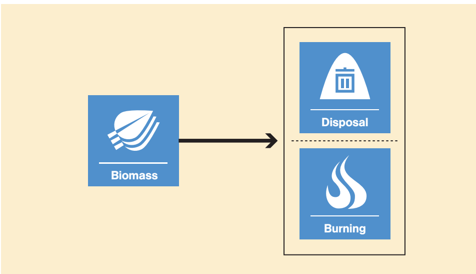
	Full intensity in the baseline scenario is depicted with bold colour.
	Reduced, decreased intensity in the project activity is depicted with pale colour.
	Avoidance and replacement is depicted with crossed icons.
	A carbon-intensive fossil fuel is used in the baseline scenario. Instead of the carbon-intensive fossil fuel, a less-carbon-intensive fossil fuel is used due to the project activity.
	
	A less-efficient technology is used in the baseline scenario. A more-efficient technology is used due to the project activity.
	
	Activities in the baseline scenario result in GHG emissions. Less GHG emissions are occurring due to the project activity.
	

EXEMPLIFICATION OF DIAGRAMS

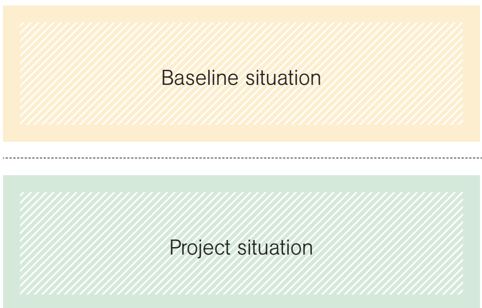
Activities in the baseline scenario result in GHG emissions. These GHG emissions are avoided due to the project activity.



Electricity is either produced by power plants connected to the grid or a captive power plant using fossil fuel.



Biomass is either left to decay or burned in an uncontrolled manner.



The project boundary encompasses all emissions of greenhouse gases under the control of the project participants that are significant and reasonably attributable to the CDM project. Due to the simplification of the diagrams, please consult each methodology for the detailed delineation of the project boundary.

Chapter II

METHODOLOGIES FOR CDM PROJECT ACTIVITIES

2.1. INTRODUCTION TO METHODOLOGIES FOR CDM PROJECT ACTIVITIES

Methodologies provide the information that is required in order to determine the amount of Certified Emission Reductions (CERs) generated by a mitigation project. The following main sections can be found in a methodology:

- Definitions that are required to apply the methodology;
- Description of the applicability of the methodology;
- Description of the project boundary;
- Procedure to identify the baseline scenario;
- Procedure to demonstrate and assess additionality;
- Procedure to calculate emission reductions;
- Description of the monitoring procedure.

Further guidance to project developers is available in form of methodological tools, guidance, guidelines and procedures (available through the CDM website).

Methodologies for large scale projects can be used for projects of any size, whereas simplified small-scale methodologies can only be applied if the activity is within certain limits. Simplified small-scale methodologies are grouped into three different types:

- *Type I:* Renewable energy projects with a maximum output capacity equivalent to up to 15 MW (or an appropriate equivalent);
- *Type II:* Energy efficiency improvement projects which reduce energy consumption, on the supply and/or demand side, by up to the equivalent of 60 GWh per year;
- *Type III:* Other projects that both reduce anthropogenic emissions by sources and directly emit less than 60 kilotonnes of carbon dioxide equivalent annually.

More detailed information on specific limits can be found in each small-scale methodology.

2.2. METHODOLOGICAL TOOLS FOR CDM PROJECT ACTIVITIES

Methodological tools are generic modules that can be referenced in large scale and small scale methodologies in order to determine a specific condition (e.g. additionality of a CDM project) or to calculate particular emissions (e.g. emissions from electricity consumption). It is stated in the methodology if a methodology requires application of a certain methodological tool. A list and a short description of current methodological tools can be found below. These tools can be accessed from the CDM website.

Tools that apply to A/R methodologies are described in Section III.

TOOL FOR THE DEMONSTRATION AND ASSESSMENT OF ADDITIONALITY

The tool provides a step-wise approach to demonstrate and assess the additionality of a CDM project. These steps are:

Step 1 Identification of alternatives to the project activity;
Step 2 Investment analysis
Step 3 Barriers analysis; and
Step 4 Common practice analysis.

The tool includes the Annex: "Guidance on the assessment of the investment analysis" and is required by many methodologies.

COMBINED TOOL TO IDENTIFY THE BASELINE SCENARIO AND DEMONSTRATE ADDITIONALITY

This tool provides for a step-wise approach to identify the baseline scenario and simultaneously demonstrate additionality. Similar to the "Tool for the demonstration and assessment of additionality" the procedure is based on four steps, however in a different order:

Step 1 Identification of alternative scenarios;
Step 2 Barrier analysis;
Step 3 Investment analysis (if applicable);
Step 4 Common practice analysis.

The tool includes also the Annex: "Guidance on the assessment of the investment analysis" and is required by various types of methodologies.

TOOL TO CALCULATE PROJECT OR LEAKAGE CO_2 EMISSIONS FROM FOSSIL FUEL COMBUSTION

This tool provides procedures to calculate project and/or leakage CO_2 emissions from the combustion of fossil fuels. It can be used in cases where CO_2 emissions from fossil fuel combustion are calculated based on the quantity of fuel combusted and its properties. This tool is required by methodologies whenever fossil fuel combustion is relevant in the project scenario or leakage.

TOOL TO DETERMINE METHANE EMISSIONS AVOIDED FROM DISPOSAL OF WASTE AT A SOLID WASTE DISPOSAL SITE

This tool calculates baseline emissions of methane from waste that would in the absence of the project activity be disposed at solid waste disposal sites (SWDS). Emission reductions are calculated with a first order decay model. The tool is applicable in cases where the solid waste disposal site can be clearly identified. The tool is required by landfill methodologies (e.g. ACM0001 or AMS-III.G.), composting methodologies (e.g. AM0025 or AMS-III.F.) and biomass methodologies (e.g. ACM0006 or AMS-III.E.).

TOOL TO CALCULATE BASELINE, PROJECT AND/OR LEAKAGE EMISSIONS FROM ELECTRICITY CONSUMPTION

This tool provides procedures to estimate the baseline, project and/or leakage emissions associated with the consumption of electricity. The tool may, for example, be required by methodologies where auxiliary electricity is consumed in the project and/or the baseline scenario.

TOOL TO DETERMINE PROJECT EMISSIONS FROM FLARING GASES CONTAINING METHANE

This tool provides procedures to calculate project emissions from flaring of a residual gas stream containing methane. Due to incomplete flaring of methane or even non-operation of the flare, methane emissions may occur in the project scenario. By determination of a flaring efficiency, such effects are taken into account. The tool is mainly required by landfill gas and biogas methodologies.

TOOL TO CALCULATE THE EMISSION FACTOR FOR AN ELECTRICITY SYSTEM

This methodological tool determines the CO_2 emission factor for the displacement of electricity generated by power plants in an electricity system, by calculating the "combined margin" emission factor of the electricity system. The combined margin is the result of a weighted average of two emission factors of the electricity system: the "operating margin" and the "build margin". The operating margin is the emission factor of the thermal power plants and all plants serving the grid that cannot be characterized as "must run". The build margin is the emission factor of a group of recently built power plants. This tool is required whenever electricity consumption or generation is relevant in the baseline and/or project scenario or in terms of leakage. It is particularly relevant for grid-connected electricity generation methodologies.

TOOL TO DETERMINE THE MASS FLOW OF A GREENHOUSE GAS IN A GASEOUS STREAM

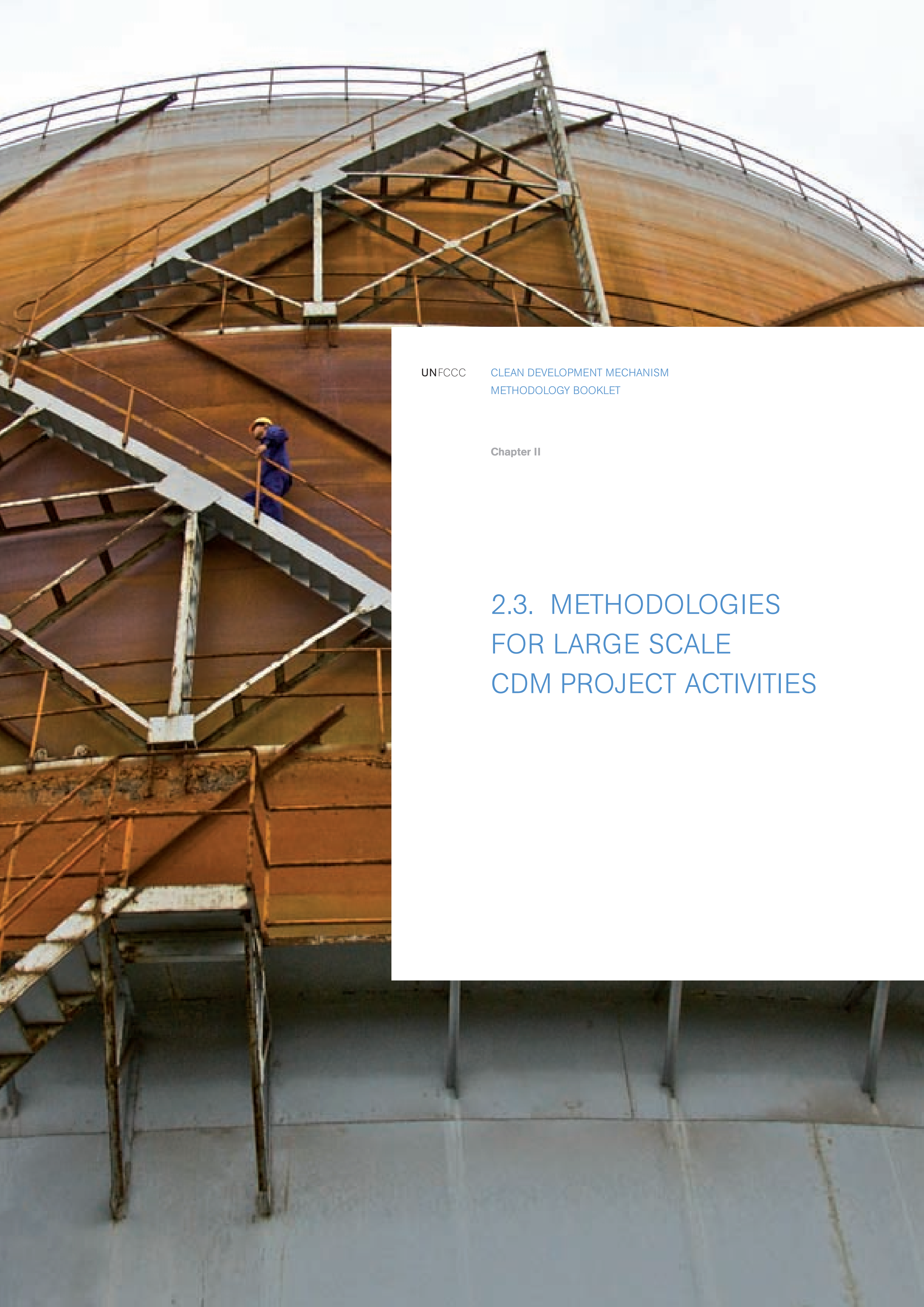
This tool provides procedures to determine the mass flow of a greenhouse gas in a gaseous stream, based on measurements of (a) the total volume or mass flow of the gas stream and (b) the volumetric fraction of the gas in the gas stream. The volume flow, mass flow and volumetric fraction may be measured on a dry basis or wet basis.

TOOL TO DETERMINE THE BASELINE EFFICIENCY OF THERMAL OR ELECTRIC ENERGY GENERATION SYSTEMS

The tool describes various procedures to determine the baseline efficiency of an energy generation system such as a power plant or an industrial boiler, for the purpose of estimating baseline emissions. The tool is used in case of projects that improve the energy efficiency of an existing system through retrofits or replacement of the existing system by a new system. This tool provides different procedures to determine the baseline efficiency of the system: either a) a load-efficiency function is determined which establishes the efficiency as a function of the operating load of the system or b) the efficiency is determined conservatively as a constant value.

TOOL TO DETERMINE THE REMAINING LIFETIME OF EQUIPMENT

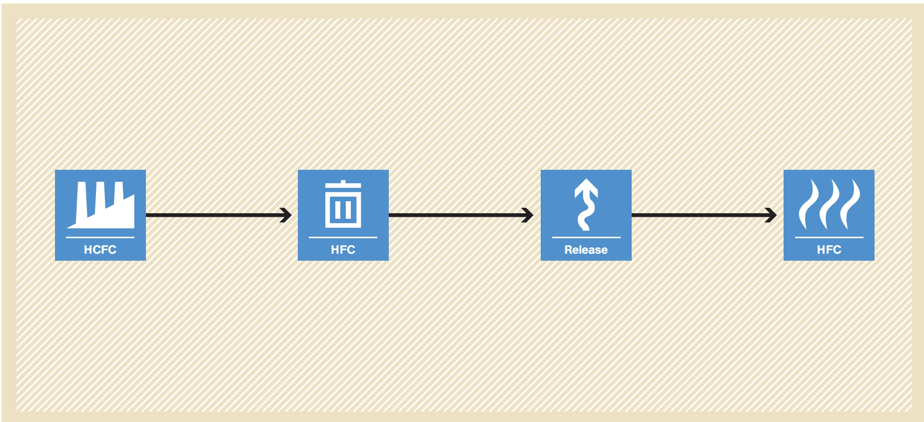
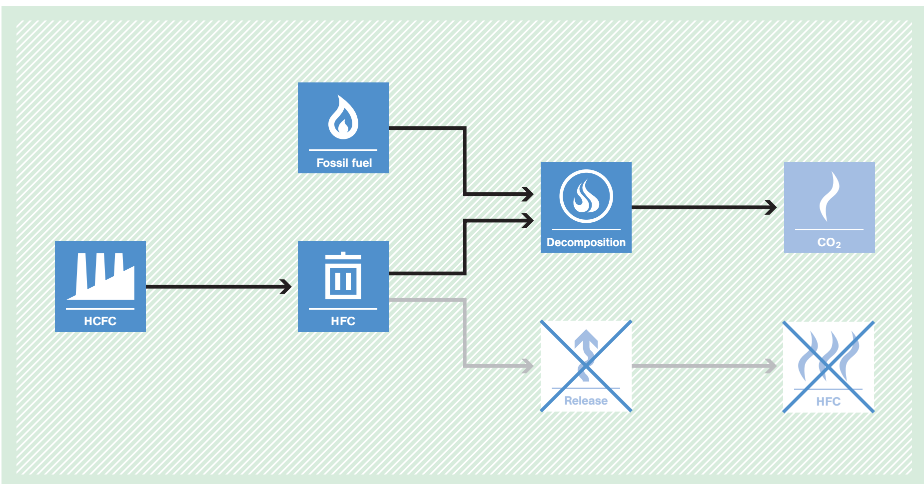
The tool provides guidance to determine the remaining lifetime of baseline or project equipment. An application of the tool would be for projects which involve the replacement of existing equipment with new equipment or which retrofit existing equipment as part of energy efficiency improvement activities. Under this tool, impacts on the lifetime of the equipment due to policies and regulations (e.g. environmental regulations) or changes in the services needed (e.g. increased energy demand) are not considered.



Chapter II

2.3. METHODOLOGIES FOR LARGE SCALE CDM PROJECT ACTIVITIES

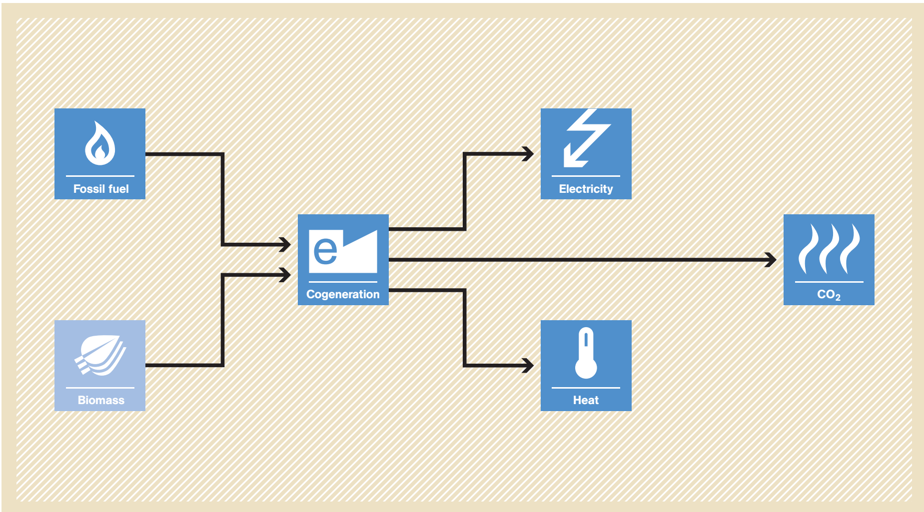
AM0001 Incineration of HFC 23 waste streams

Typical project(s)	Destruction of HFC-23 generated during the production of HCFC-22 that otherwise would be vented into the atmosphere.
Type of GHG emissions mitigation action	• GHG destruction. Thermal destruction of HFC-23 emissions.
Important conditions under which the methodology is applicable	• The HCFC-22 production facility has an operating history of at least three years between the beginning of the year 2000 and the end of the year 2004 and has been in operation from 2005 until the start of the project; • The HFC-23 destruction occurs at the same industrial site where the HCFC-22 production facility is located; • There is no regulatory requirement for destruction of the total amount of HFC-23 waste.
Important parameters	At validation: • The maximum historical annual production of HCFC-22 during any of the most recent three years of operation between the year 2000 and 2004; • The minimum historical rate of HFC-23 generation in the HCFC-22 production during any of the most recent three years of operation up to 2004.
	Monitored: • Production of HCFC-22; • Quantity of HFC-23 destroyed; • Quantity of HFC-23 not destroyed.
BASELINE SCENARIO HFC-23 generated during the production of HCFC-22 is released to the atmosphere.	
PROJECT SCENARIO HFC-23 is destroyed in the HCFC-22 production facility.	

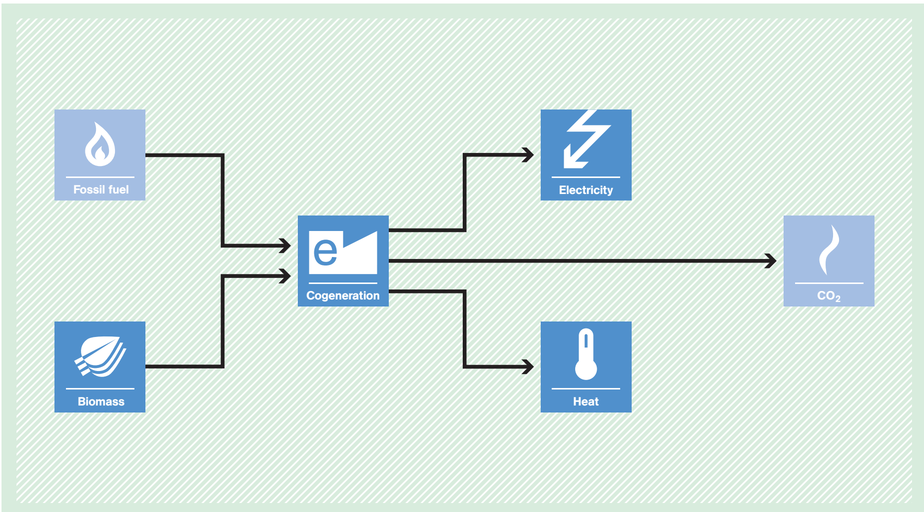
AM0007 Analysis of the least-cost fuel option for seasonally-operating biomass cogeneration plants

Typical project(s)	Refurbishment and fuel switch of renewable biomass cogeneration projects connected to the grid which operate in seasonal mode and use other fuel during the off-season, when biomass – for instance bagasse in case of a sugar mill – is not being produced.
Type of GHG emissions mitigation action	• Renewable Energy. Displacement of more-GHG-intensive power generation using fossil fuel.
Important conditions under which the methodology is applicable	• The proposed project has access to biomass that is not currently used for energy purposes.
Important parameters	At validation: • Leakage emissions due to biomass transport and crowding out of biomass for other plants; • Baseline emission factor of the cogeneration plant based on the use of the least-cost fuel available (usually fossil fuel). Monitored: • Power generated by the project; • Quantity of biomass used in the project; • Electricity and fossil fuel consumption of the project.

BASELINE SCENARIO
Power would be produced with the least cost fuel (usually fossil fuels) in the absence of the project.



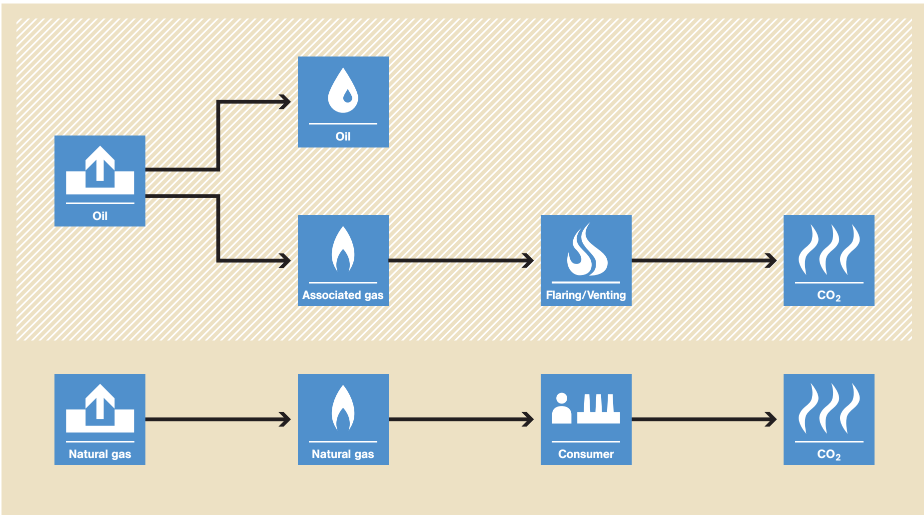
PROJECT SCENARIO
Use of renewable biomass for power generation avoids the use of fossil fuel.



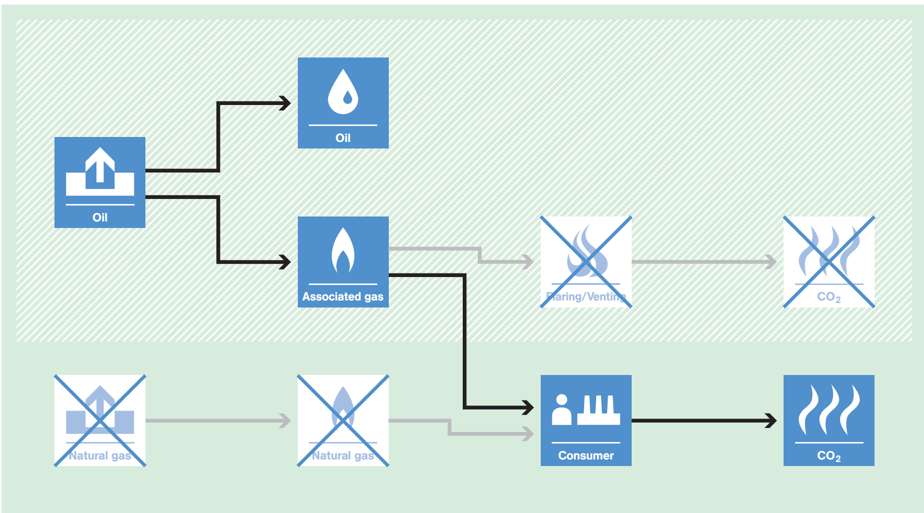
AM0009 Recovery and utilization of gas from oil wells that would otherwise be flared or vented

Typical project(s)	Associated gas from oil wells (including gas-lift gas) that was previously flared or vented is recovered and utilized.
Type of GHG emissions mitigation action	• Fuel switch. Displacement of use of other fossil fuel sources such as natural gas, dry gas, LPG, condensate etc. coming from non-associated gas by utilizing associated gas and/or gas-lift gas from oil wells.
Important conditions under which the methodology is applicable	• The recovered gas comes from oil wells that are in operation and are producing oil at the time of the recovery; • The project does not lead to changes in the process of oil production, such as an increase in the quantity or quality of oil extracted; • The recovered gas is used on-site; or supplied to a gas pipeline without processing; or transported to a processing plant where it is processed into hydrocarbon products (e.g. dry gas, LPG and condensate) and sold to final consumer(s).
Important parameters	Monitored: • Quantity and net calorific value of the total recovered gas measured after pre-treatment and before use.

BASELINE SCENARIO
Associated gas from oil wells is flared or vented and non-associated gas is extracted from other gas wells.



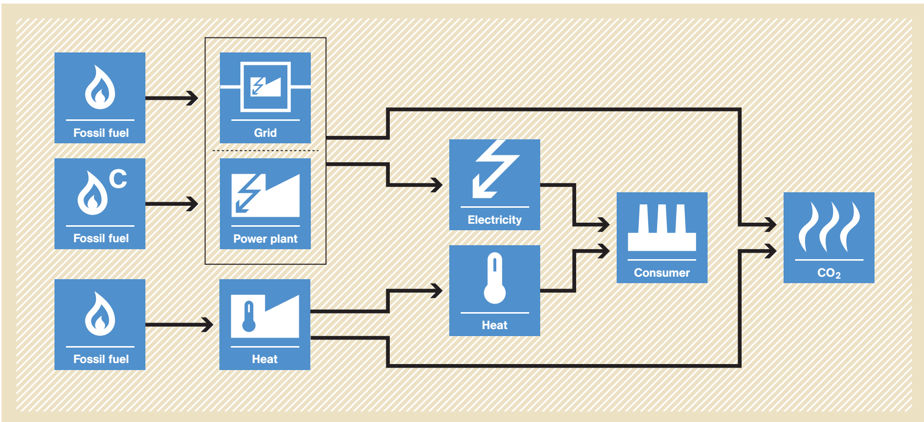
PROJECT SCENARIO
Associated gas from oil wells is recovered and utilized and non-associated gas is not extracted from other gas wells.



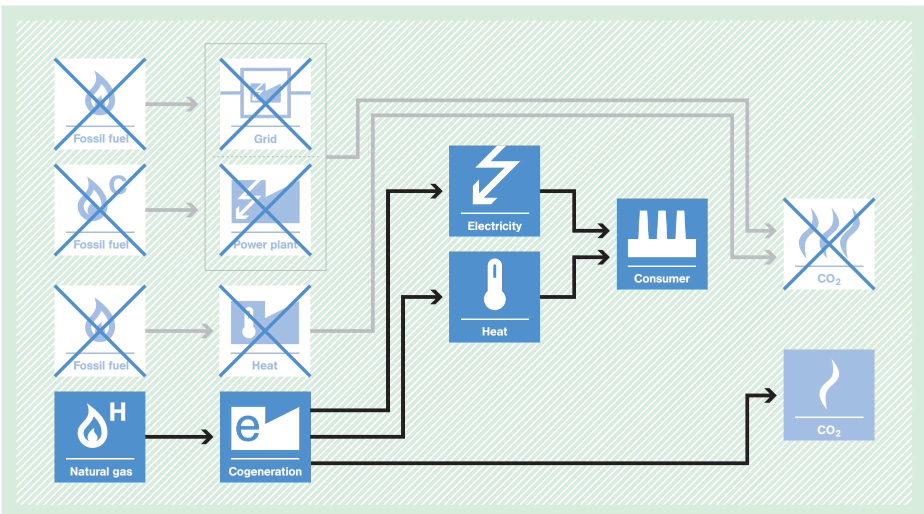
AM0014 Natural gas-based package cogeneration

Typical project(s)	Construction and operation of a natural-gas-fired cogeneration plant that supplies electricity and heat to an existing consuming facility.
Type of GHG emissions mitigation action	• Energy efficiency; • Fuel switch. Fuel savings through energy efficiency improvement. Optional use of a less-carbon-intensive fuel.
Important conditions under which the methodology is applicable	• The electricity and heat requirement of the facility that the project cogeneration plant supplies to (consuming facility) would be generated in separate systems in the absence of the project; • No surplus electricity from the cogeneration plant is supplied to the grid; • No surplus heat from the cogeneration plant is provided to users different from the consuming facility.
Important parameters	At validation: • Fuel consumption for heat supply by the existing heat-only generation units; • Electricity generation by the grid or the existing power-only generation units; • Emission factor of the grid or the existing power-only generation units.
	Monitored: • Natural gas consumption by the project cogeneration plant; • Electricity supplied by the project cogeneration plant to the consuming facility; • Heat supplied by the project cogeneration plant to the consuming facility.

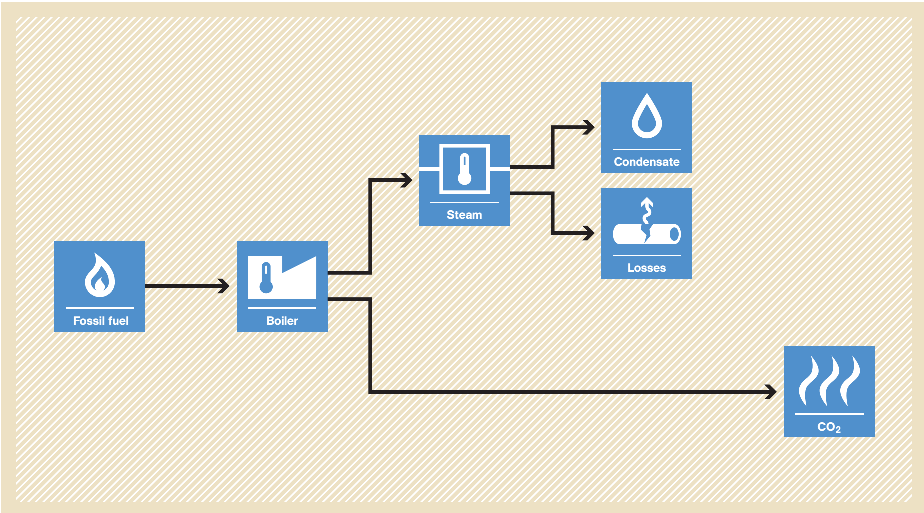
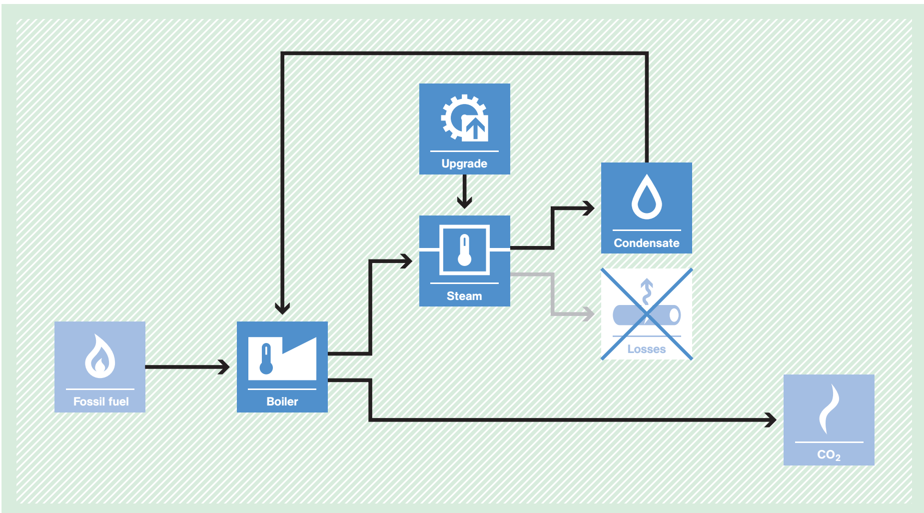
BASELINE SCENARIO
The electricity demand of a facility is meeting via either power-only generation units, or the grid and heat from heat-only generation units.



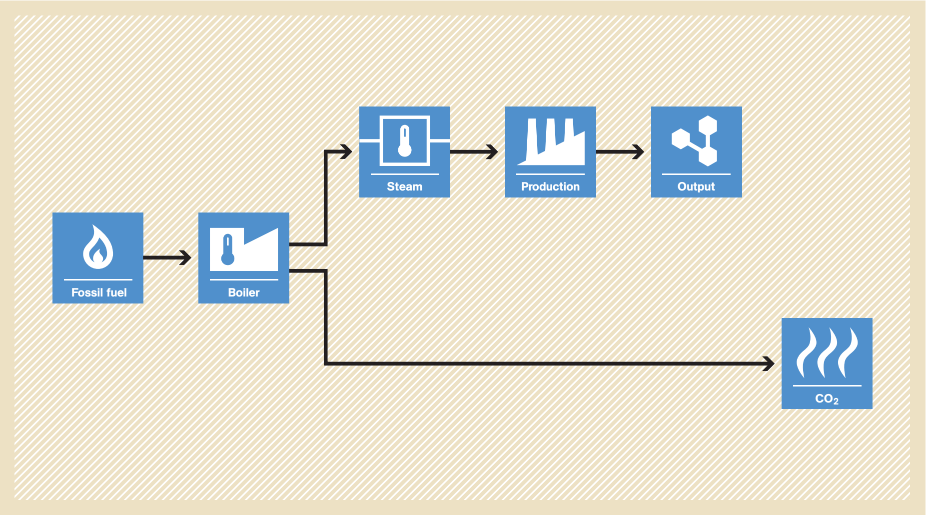
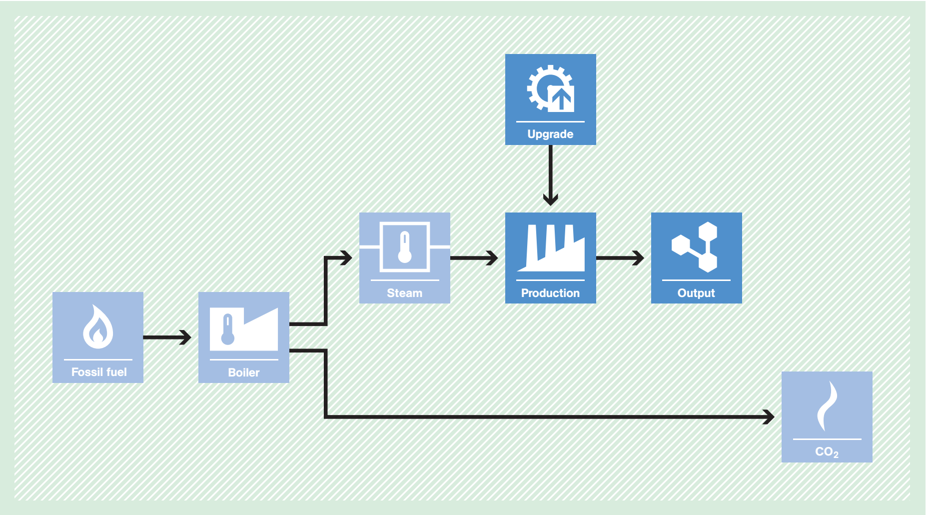
PROJECT SCENARIO
The consuming facility is supplied electricity and heat from a naturalgas-fired cogeneration plant.



AM0017 Steam system efficiency improvements by replacing steam traps and returning condensate

Typical project(s)	Optimization of steam distribution, end-use and condensate return to increase the energy efficiency of a steam system.
Type of GHG emissions mitigation action	• Energy efficiency. Reduction of fossil fuel use and corresponding emissions through energy efficiency improvements.
Important conditions under which the methodology is applicable	• Steam is generated in a boiler fired with fossil fuel; • The regular maintenance of steam traps or the return of condensate is not common practice or required under regulations in the respective country; • Data on the condition of steam traps and the return of condensate is accessible in at least five other similar plants.
Important parameters	At validation: • Steam trap failure rate and condensate return at plant and other similar plants.
	Monitored: • Steam and condensate flow, temperature and pressure; • Boiler efficiency; • Electricity consumption of the project.
BASELINE SCENARIO Use of fossil fuel in a boiler to supply steam to a steam system with a low efficiency.	
PROJECT SCENARIO Use of less fossil fuel in a boiler as less steam is required for the steam system with improved efficiency.	

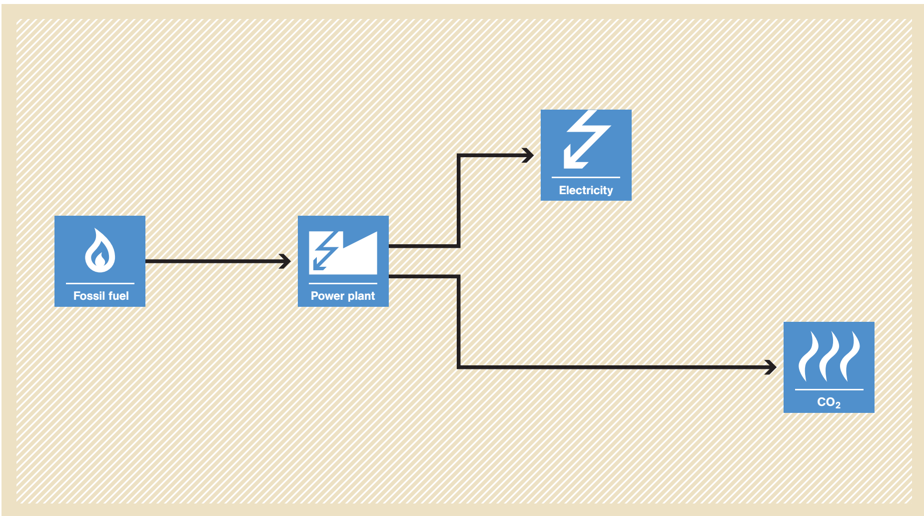
AM0018 Baseline methodology for steam optimization systems

Typical project(s)	More-efficient use of steam in a production process reduces steam consumption and thereby steam generation.
Type of GHG emissions mitigation action	• Energy efficiency. Reduction of fossil fuel use and corresponding emissions through energy efficiency improvements.
Important conditions under which the methodology is applicable	• The process supplied by the heat system produces a homogeneous output and its production volume is reasonably constant under steady state conditions; • For cogeneration systems, steam generation at boiler decreases by the amount of steam saved; • If the steam saved is further used, it shall be demonstrated it does not increase GHG emissions.
Important parameters	Monitored: • Output of the main process involved in the project; • Steam, feed water, blow down water flow, temperature and pressure; • Boiler efficiency.
BASELINE SCENARIO Use of fossil fuel in a boiler to supply steam to a process with high steam consumption.	
PROJECT SCENARIO Use of less fossil fuel in a boiler as less steam is required for the process with a higher efficiency.	

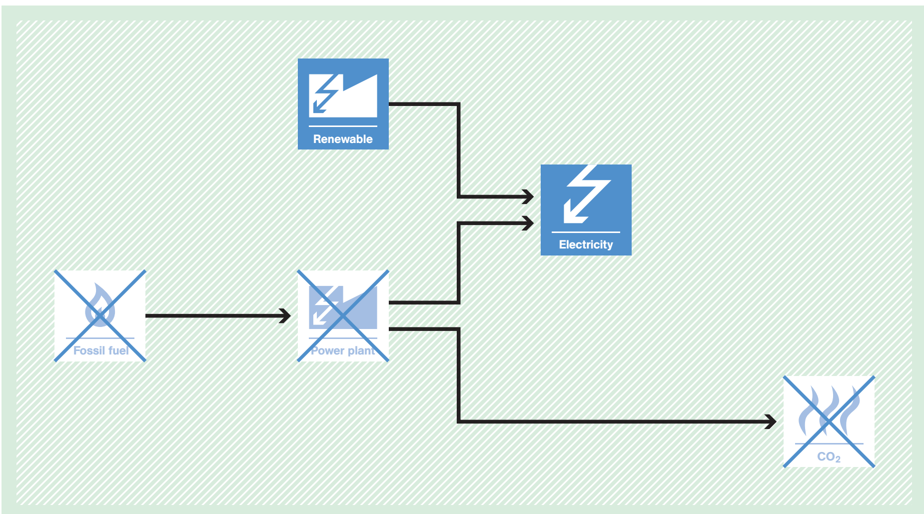
AM0019 Renewable energy projects replacing part of the electricity production of one single fossil fuel fired power plant that stands alone or supplies to a grid, excluding biomass projects

Typical project(s)	Generation of electricity from the zero-emission renewable energy sources such as wind, geothermal, solar, hydro, wave and/or tidal projects that displaces electricity produced from a specific fossil fuel plant.
Type of GHG emissions mitigation action	• Renewable energy. Displacement of more-GHG-intensive generation of electricity by the use of renewable energy sources.
Important conditions under which the methodology is applicable	• Biomass projects are not eligible; • The identified baseline plant is able to meet any possible increase of energy demand that occurs during the crediting period; • Three years of historical data is required for the calculation of emissions reductions; • Hydro power plants with reservoir require power densities greater than 4W/m^2.
Important parameters	At validation: • Carbon emission factor of the baseline power plant
	Monitored: • Quantity of electricity supplied to the grid by the project; • If the project involves geothermal energy: fugitive CO_2 and CH_4 emissions due to release of non-condensable gases from the produced steam.

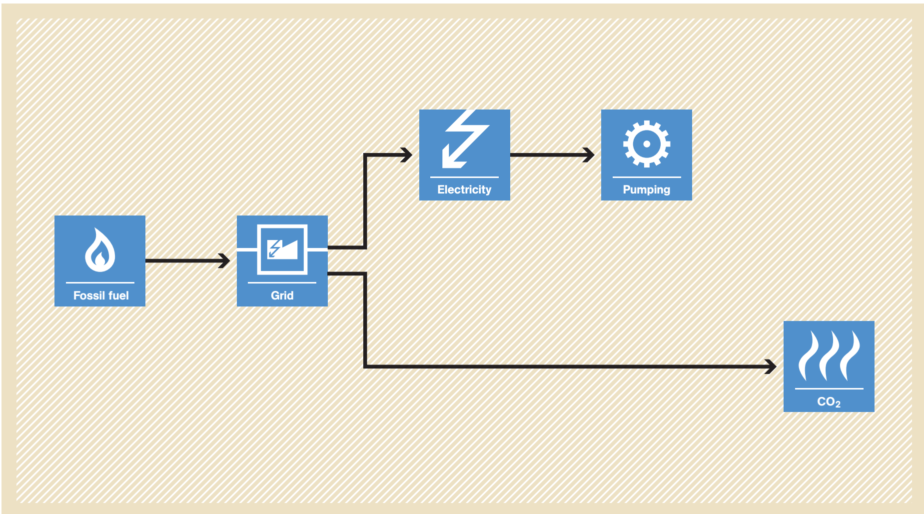
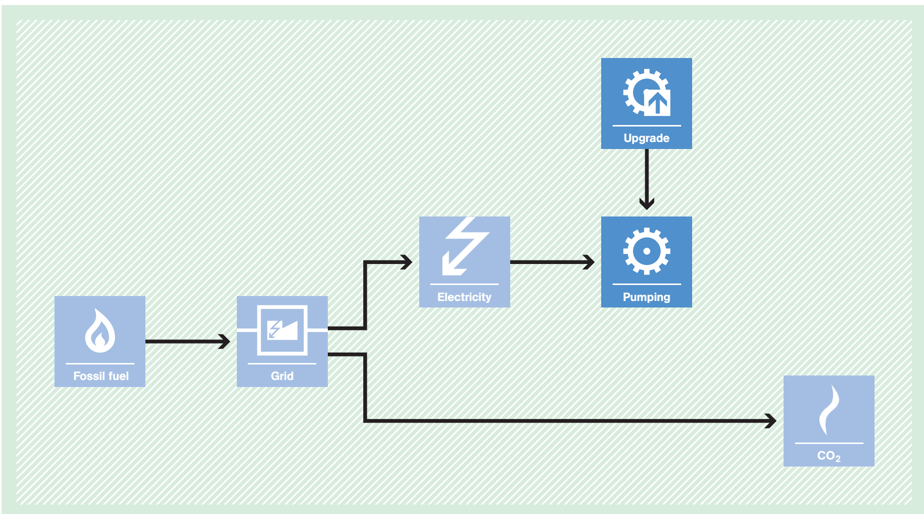
BASELINE SCENARIO
A specific fossil fuel plant generates electricity that is supplied to the grid.



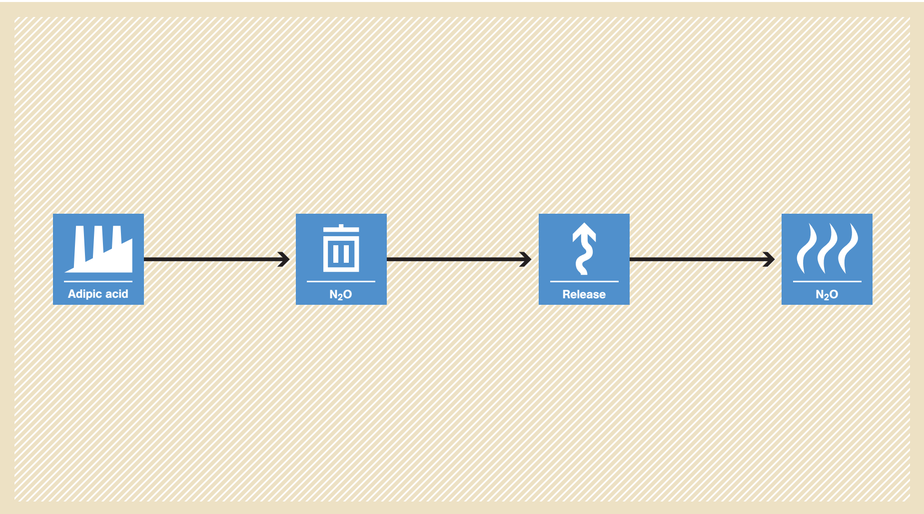
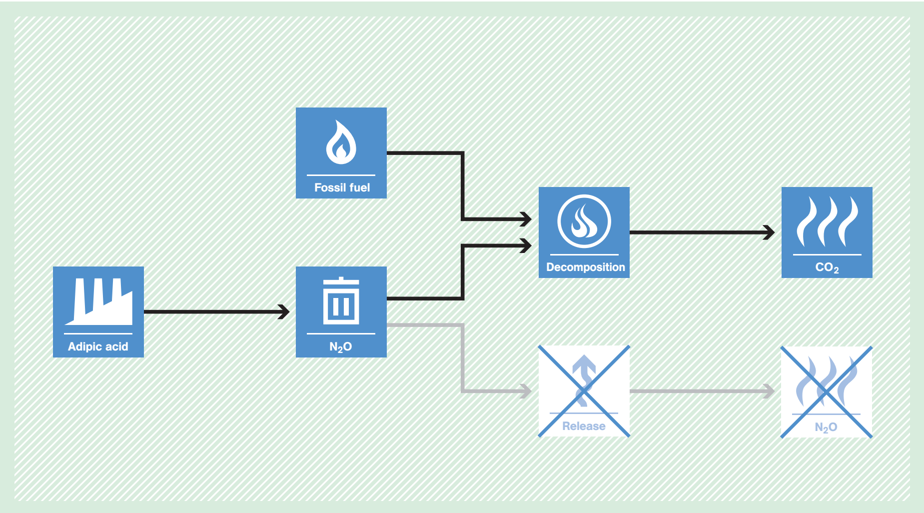
PROJECT SCENARIO
A renewable energy plant partially or completely displaces the electricity that is generated by the specific fossil fuel power plant.



AM0020 Baseline methodology for water pumping efficiency improvements

Typical project(s)	Grid electricity savings by increasing the energy efficiency of a water pumping system through measures including reduction in technical losses, reduction in leaks and improvement in the energy efficiency of the pumping system/s (or scheme/s).
Type of GHG emissions mitigation action	• Energy efficiency. Switch to more energy-efficient technology.
Important conditions under which the methodology is applicable	• The project pumping system is powered by grid electricity; • No performance related contract or policies in place that would trigger improvements; • New system/s developed to completely replace the old pumping system/s that will no longer be used, however the methodology applies to new system/s only up to the measured delivery capacity of the old system/s; • This methodology is not applicable to projects where entirely new system/s is/are implemented to augment the existing capacity.
Important parameters	At validation: • Water supplied and power consumption in the baseline situation.
	Monitored: • Grid emission factor; • Water volume supplied by the project; • Electrical energy required to deliver water within the boundaries of the system.
BASELINE SCENARIO Delivery of water from an inefficient pumping system.	
PROJECT SCENARIO Delivery of water from the pumping system that has a lower energy demand due to reducing losses or leaks in the pumping system and/or by implementing measures to increase energy efficiency.	

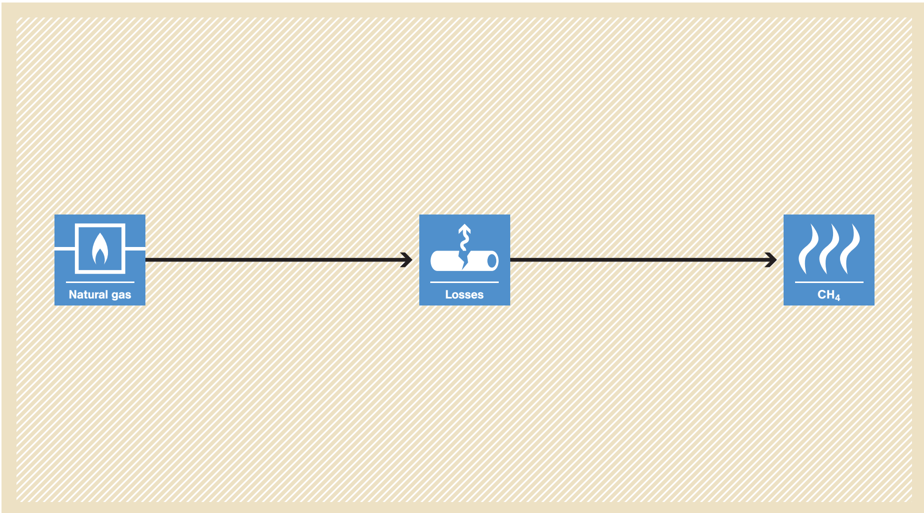
AM0021 Baseline methodology for decomposition of N_2O from existing adipic acid production plants

Typical project(s)	Installation of a catalytic or thermal N_2O destruction facility at an existing adipic acid production plant.
Type of GHG emissions mitigation action	• GHG destruction. Catalytic or thermal destruction of N_2O emissions.
Important conditions under which the methodology is applicable	• The adipic acid plant started the commercial production no later than December 31, 2004; • European Norm 14181 must be followed for real-time measurement of N_2O concentration and gas volume flow rate.
Important parameters	At validation: • Maximum amount of adipic acid production in the most recent three years.
	Monitored: • Production of adipic acid; • Consumption of nitric acid; • N_2O concentration at the inlet and outlet of the destruction facility; • Volume of gas flow at the inlet and outlet of the destruction facility.
BASELINE SCENARIO N_2O is emitted into the atmosphere during the production of adipic acid.	
PROJECT SCENARIO N_2O is destroyed in a catalytic or thermal destruction unit.	

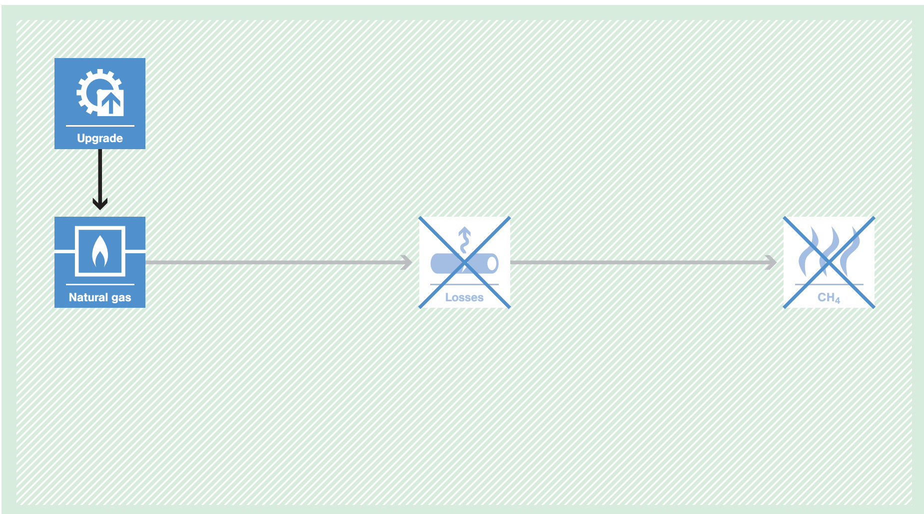
AM0023 Leak reduction from natural gas pipeline compressor or gate stations

Typical project(s)	Identification and repair of natural gas leaks in a compression or a gate station of a natural gas transmission and distribution system.
Type of GHG emissions mitigation action	• GHG formation avoidance. Avoidance of CH_4 emissions in natural gas transmission/distribution systems.
Important conditions under which the methodology is applicable	• No systems are in place to systematically identify and repair leaks in the transmission and distribution system; • Leaks can be identified and accurately measured; • A monitoring system can ensures the permanence of the repairs.
Important parameters	Monitored: • Leak flow; • Methane concentration in the flow.

BASELINE SCENARIO
CH_4 leaks from a natural gas transmission distribution system.



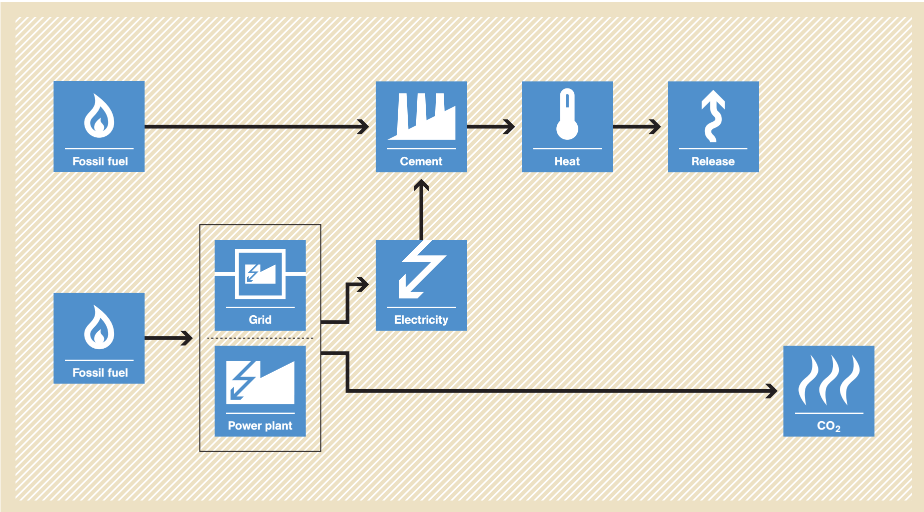
PROJECT SCENARIO
CH_4 leaks from the natural gas transmission systems have been repaired.



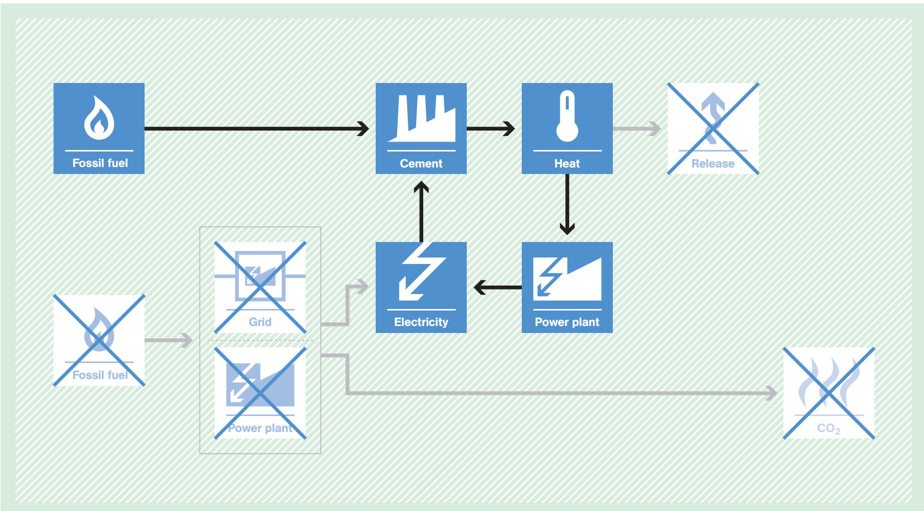
AM0024 Baseline methodology for greenhouse gas reductions through waste heat recovery and utilization for power generation at cement plants

Typical project(s)	Power generation from waste heat recovered from flue gases at a cement plant.
Type of GHG emissions mitigation action	• Energy efficiency. Reduction of GHG emissions associated with the electricity consumed from the grid or from a captive power plant.
Important conditions under which the methodology is applicable	• The electricity produced is used within the cement works where the proposed project is located and excess electricity is supplied to the grid; • The project does not divert waste heat that is or would have been used outside the system boundaries.
Important parameters	At validation: • In case of captive electricity generation: electricity emission factor. Monitored: • Clinker production of the cement works; • Annual energy consumption of clinker-making process; • Electricity supplied to the cement plant or the grid; • Emission factor of the grid where the project dispatches the electricity.

BASELINE SCENARIO
Waste heat from the cement plant is not used. Fossil fuel is used to generate either electricity on-site or electricity from the grid is used in the cement plant.



PROJECT SCENARIO
Waste heat from the cement plant is used to produce electricity. The generated electricity replaces fossil fuel previously used to generate electricity or grid electricity.



AM0025 Avoided emissions from organic waste through alternative waste treatment processes

Typical project(s)

The project involves one or a combination of the following waste treatment options: composting process in aerobic conditions; or gasification to produce syngas and its use; or anaerobic digestion with biogas collection and flaring and/or its use (this includes processing and upgrading biogas and then distribution of it via a natural gas distribution grid); or mechanical/thermal treatment process to produce refuse-derived fuel (RDF)/stabilized biomass (SB) and its use; or incineration of fresh waste for energy generation, electricity and/or heat.

Type of GHG emissions mitigation action

- GHG emission avoidance;
- Renewable energy.

CH_4 emissions due to anaerobic decay of organic waste is avoided by alternative waste treatment processes. Organic waste is used as renewable energy source.

Important conditions under which the methodology is applicable

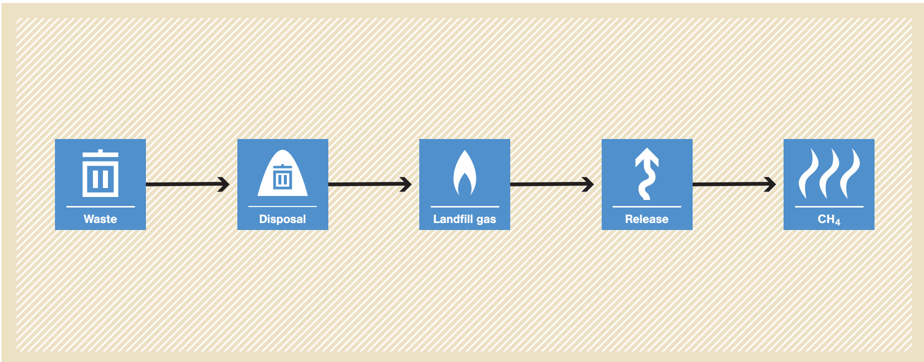
- The proportions and characteristics of different types of organic waste processed in the project can be determined;
- Neither industrial nor hospital waste may be incinerated;
- In case of anaerobic digestion, gasification or RDF processing of waste, the residual waste from these processes is aerobically composted and/or delivered to a landfill;
- The baseline scenario is the disposal of the waste in a landfill site without capturing landfill gas or with partly capturing it and subsequently flaring it.

Important parameters

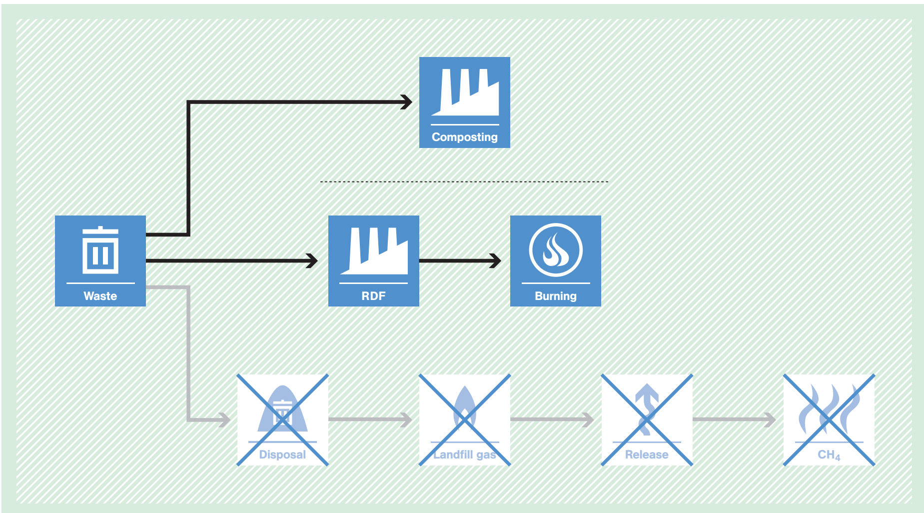
Monitored:

- Weight fraction of the different waste types in a sample and total amount of organic waste prevented from disposal;
- Electricity and fossil fuel consumption in the project site.

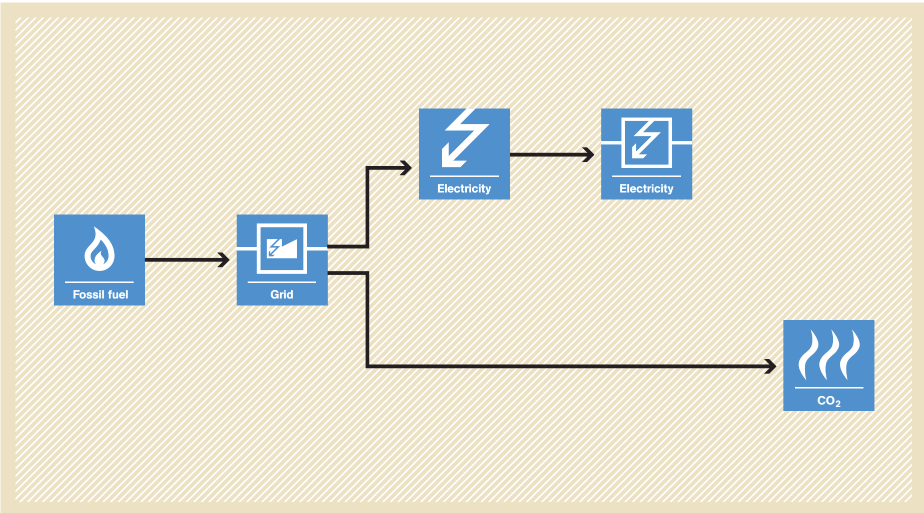
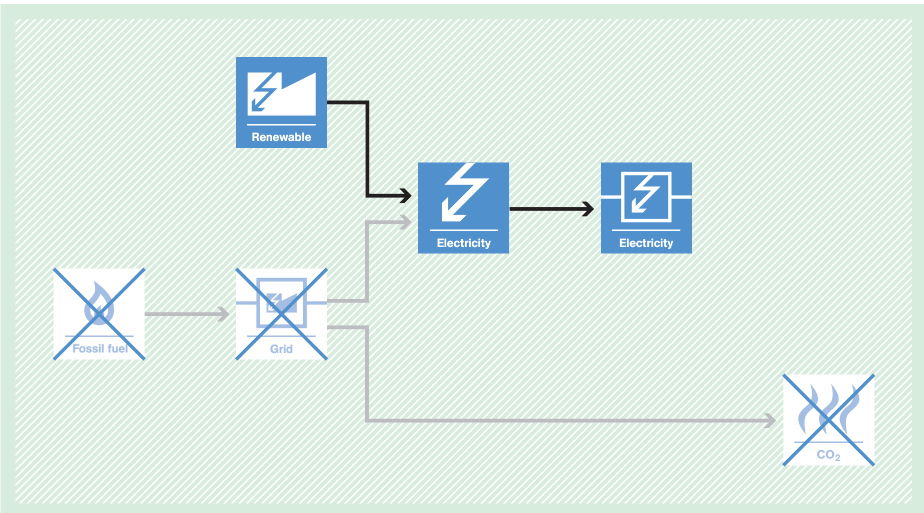
BASELINE SCENARIO
Disposal of the waste in a landfill site without capturing landfill gas or with partly capturing and subsequently flaring it.



PROJECT SCENARIO
Alternative waste treatment process. Such processes could be composting, gasification, anaerobic digestion with biogas collection and flaring and/or its use, mechanical/thermal treatment process to produce RDF or SB and its use, or incineration of fresh waste for energy generation.



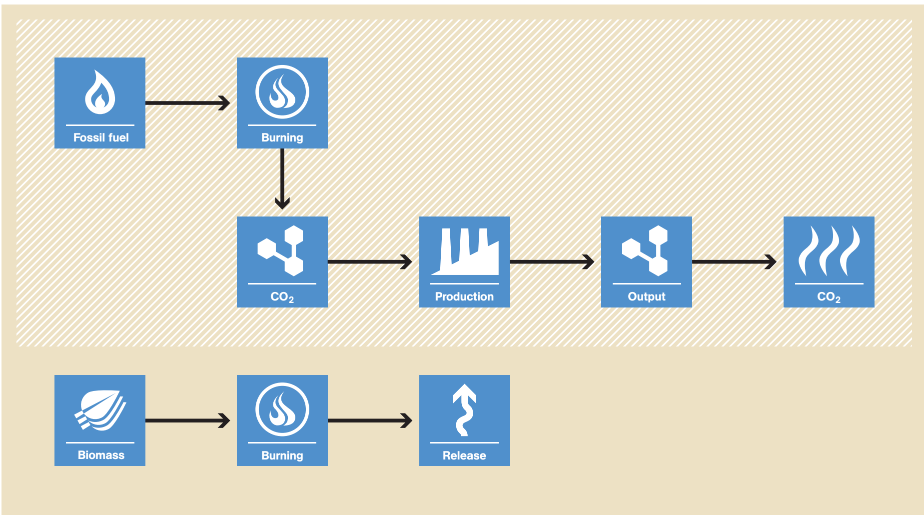
AM0026 Methodology for zero-emissions grid-connected electricity generation from renewable sources in Chile or in countries with merit order based dispatch grid

Typical project(s)	Electricity capacity additions (either through the installation of new, or the modification of existing, power plants) that supply electricity to the grid and use renewable energy sources such as hydro, wind, solar, geothermal, wave or tidal power. The capacity additions have to be connected to the Chilean interconnected grid or others countries' grids providing a similar merit order based framework.
Type of GHG emissions mitigation action	• Renewable energy. Displacement of electricity that would be provided to the grid by more-GHG-intensive means.
Important conditions under which the methodology is applicable	• The project power plant must either be connected to the grid of Chile and fulfil the legal obligations under the Chilean Electricity Regulation, or be implemented in other countries if the country has a regulatory framework for electricity generation and dispatch that meets the conditions described in the methodology; • New hydroelectric power projects with reservoirs require power densities greater than 4 W/m^2.
Important parameters	Monitored: • Electricity supplied to the grid by the project; • Hourly data for merit order based on marginal costs; • Operational data of the power plants connected to the same grid as the project.
BASELINE SCENARIO Power is provided to the grid using more-GHG-intensive power sources.	
PROJECT SCENARIO Installation of a new, or modification of an existing, renewable power plant that results in an increase of renewable power and displacement of electricity that would be provided to the grid by more-GHG-intensive means.	

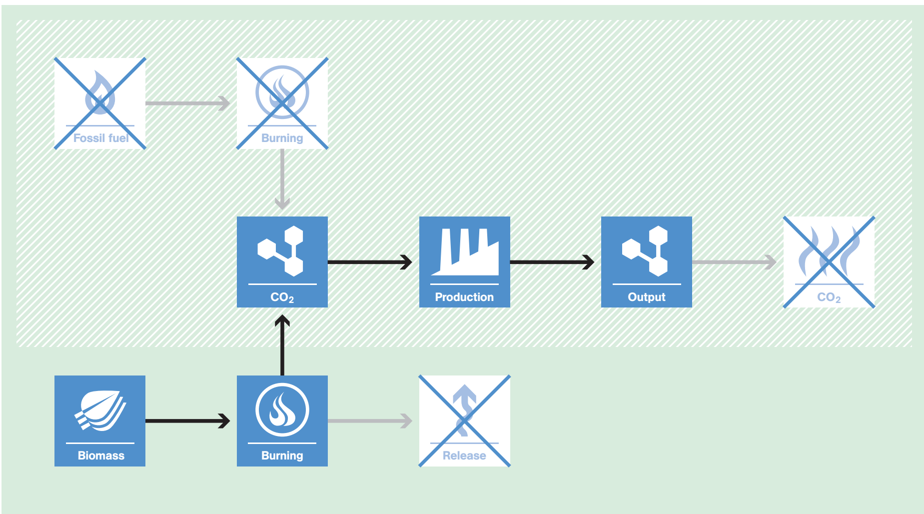
AM0027 Substitution of CO_2 from fossil or mineral origin by CO_2 from renewable sources in the production of inorganic compounds

Typical project(s)	Biomass is used as a renewable source of CO_2 for the manufacturing of inorganic compounds instead of mineral or fossil CO_2.
Type of GHG emissions mitigation action	• Feedstock switch. Switch from CO_2 of fossil or mineral origin to CO_2 from renewable sources.
Important conditions under which the methodology is applicable	• The CO_2 from the renewable source was already produced and is not diverted from another application; • CO_2 from fossil or mineral sources used for the production of inorganic compounds in the baseline is from a production process whose only useful output is CO_2 and will not be emitted to the atmosphere in the project scenario. The CO_2 production process from fossil source does not produce any energy by-product; • No additional significant energy quantities are required to prepare the renewable CO_2 for use in the project.
Important parameters	Monitored: • Amount of inorganic compound produced; • Carbon content and molecular weight of the inorganic compound; • Amounts of non-renewable and renewable CO_2 used for the production of inorganic compounds.

BASELINE SCENARIO
Fossil or mineral sources are the source of CO_2 for the production of inorganic compounds.



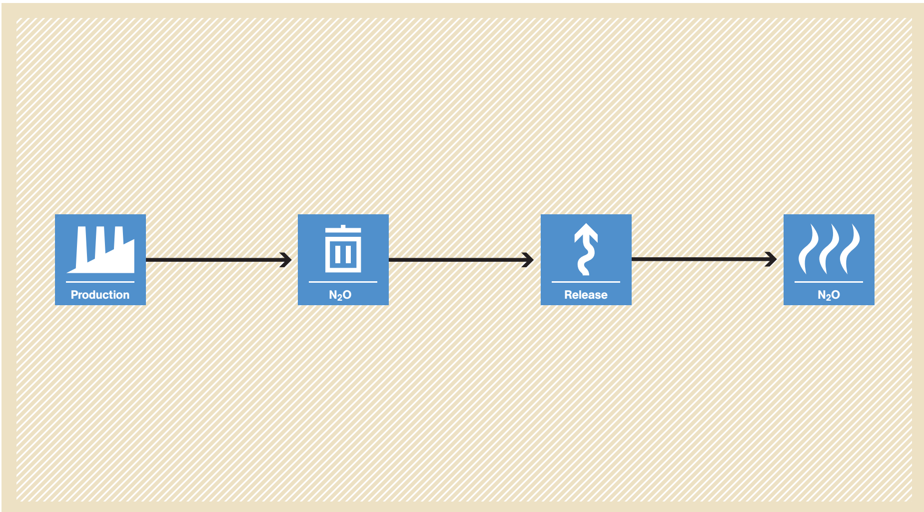
PROJECT SCENARIO
Renewable sources of CO_2 are the source of CO_2 for the production of inorganic compounds.



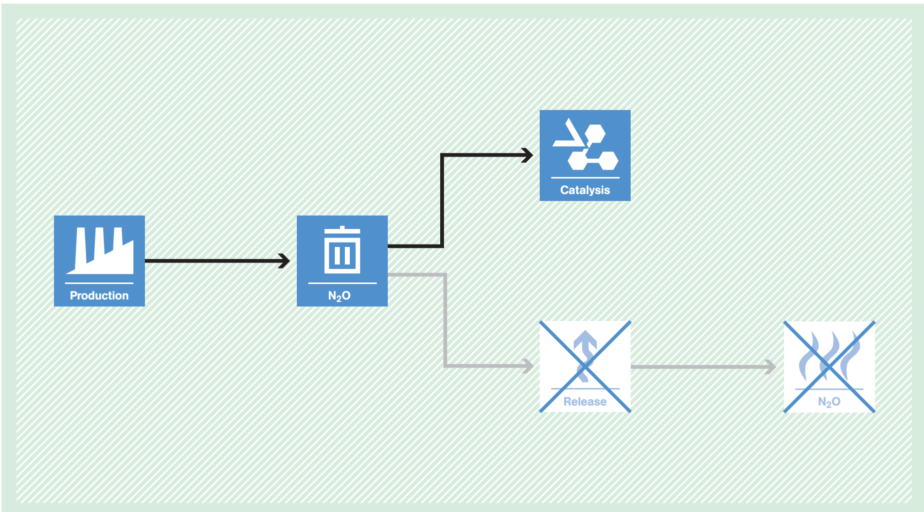
AM0028 Catalytic N_2O destruction in the tail gas of nitric acid or caprolactam production plants

Typical project(s)	Installation of a catalytic reduction unit to destroy N_2O emissions in the tail gas of nitric acid or caprolactam production plants.
Type of GHG emissions mitigation action	• GHG destruction. Catalytic destruction of N_2O emissions.
Important conditions under which the methodology is applicable	• The nitric acid or caprolactam plant started the commercial production no later than December 31, 2005; • Caprolactam plants are limited to those employing the Raschig or HPO® processes; • European Norm 14181 or an equivalent standard must be followed for real-time measurement of N_2O concentration and gas volume flow rate.
Important parameters	At validation: • Normal operating conditions of the plant (oxidation temperature and pressure, ammonia gas flow rate to AOR, and composition of ammonia oxidation catalyst).
	Monitored: • Production of nitric acid or caprolactam; • Volume of gas flow at the inlet and outlet of the destruction facility; • N_2O concentration at the inlet and outlet of the destruction facility; • Update of the parameters for determining the normal operating conditions of the plant.

BASELINE SCENARIO
N_2O is emitted into the atmosphere during the production of nitric acid or caprolactam.



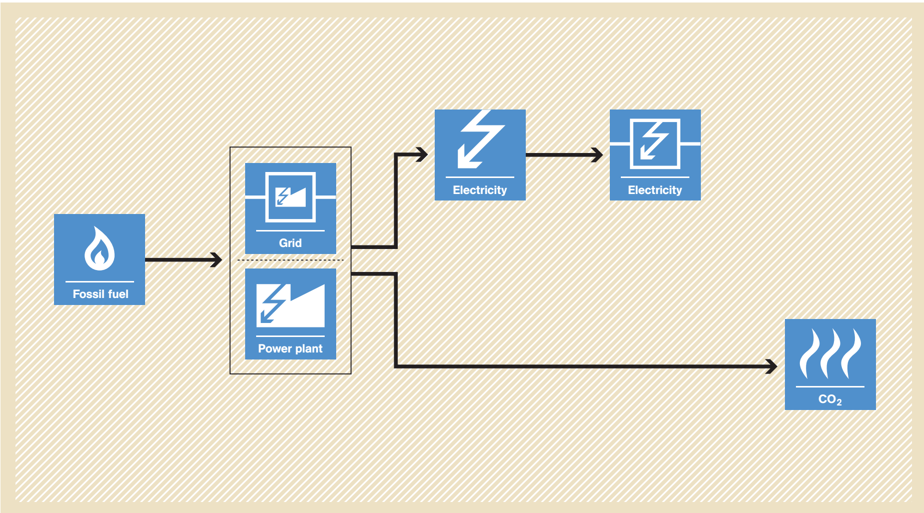
PROJECT SCENARIO
N_2O is destroyed in a catalytic destruction unit installed at the tail gas stream.



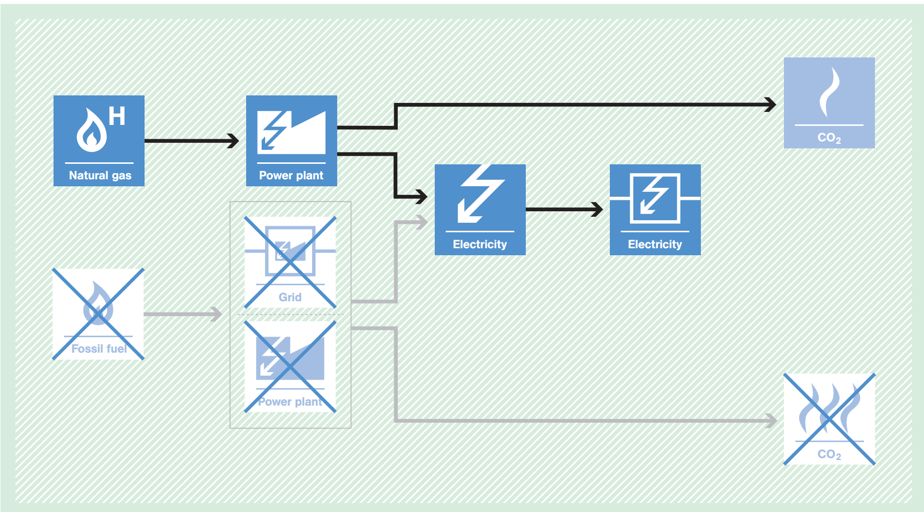
AM0029 Baseline methodology for grid connected electricity generation plants using natural gas

Typical project(s)	The construction and operation of a new natural-gas-fired power plant that supplies electricity to the grid.
Type of GHG emissions mitigation action	• Low carbon electricity. Displacement of electricity that would be provided by more-carbon-intensive means.
Important conditions under which the methodology is applicable	• Natural gas is sufficiently available in the region or country; • Electricity generated by the project is exclusively supplied to a power grid.
Important parameters	At validation: • Emission factor of baseline electricity generation, derived from an emission factor of the power grid, or the power generation technology that would most likely be used in the absence of the project.
	Monitored: • Fuel consumption of the project power plant; • Electricity generation of the project power plant.

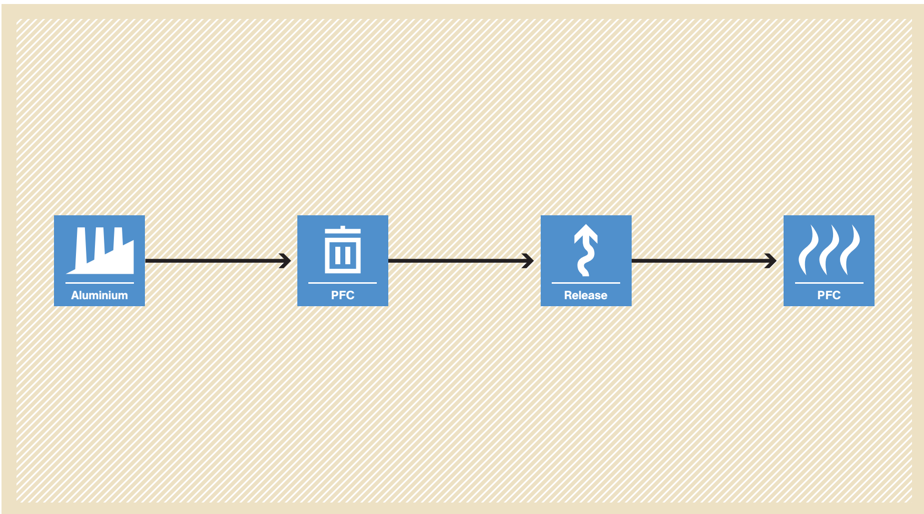
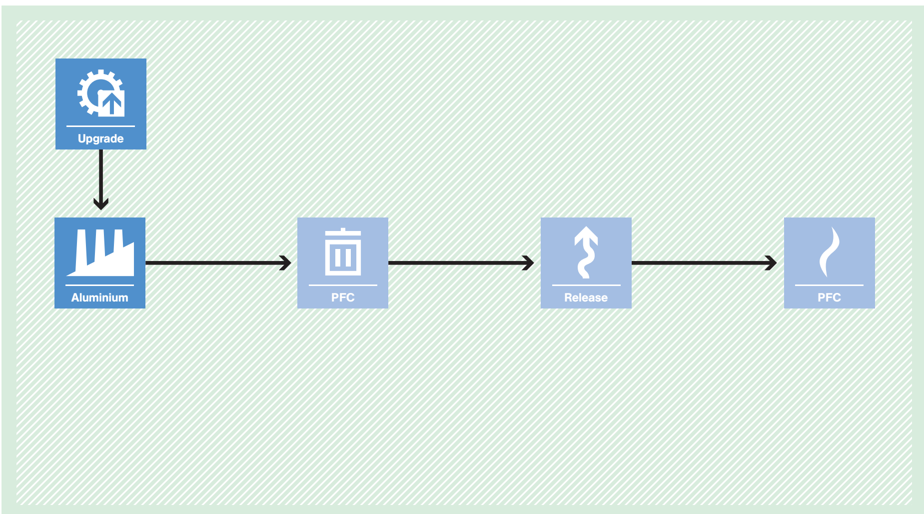
BASELINE SCENARIO
- Power generation using natural gas, but based on less-efficient technologies than the project ones;
- Power generation using fossil fuels other than natural gas;
- Import of electricity from the electricity grid.



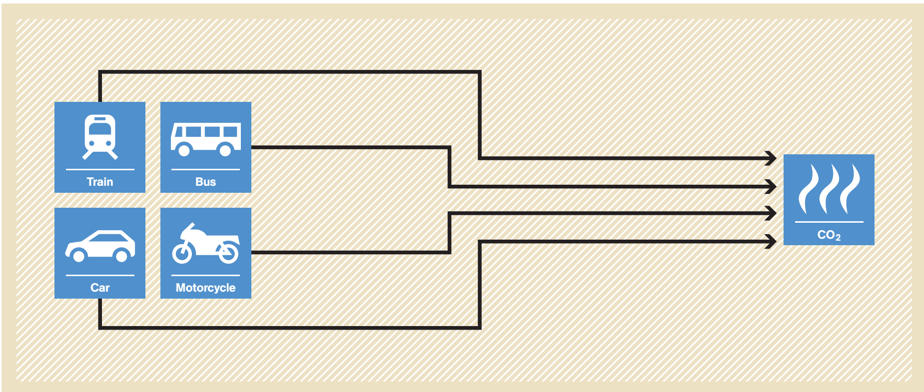
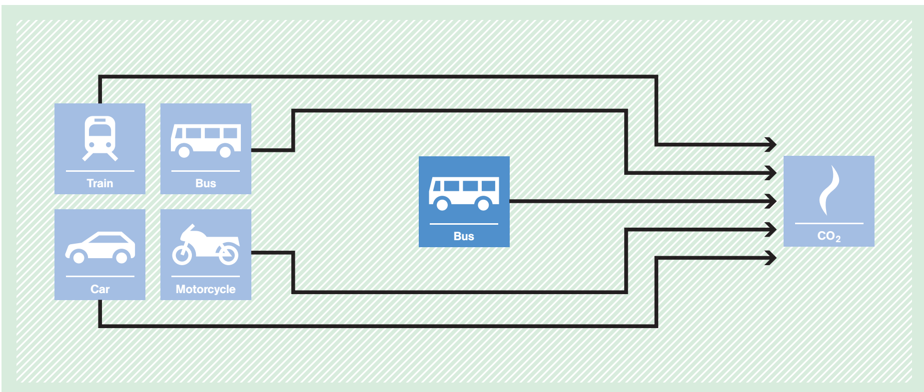
PROJECT SCENARIO
- Power supply to the electricity grid by a new natural-gas-fired power generation plant.



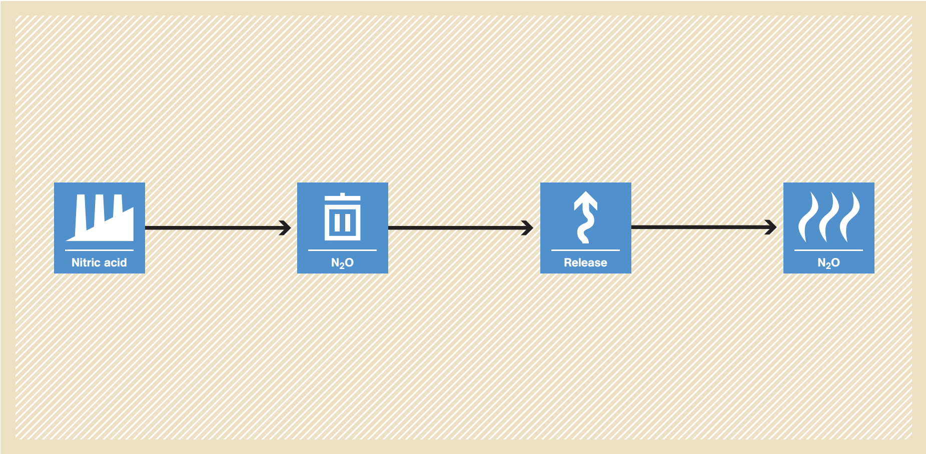
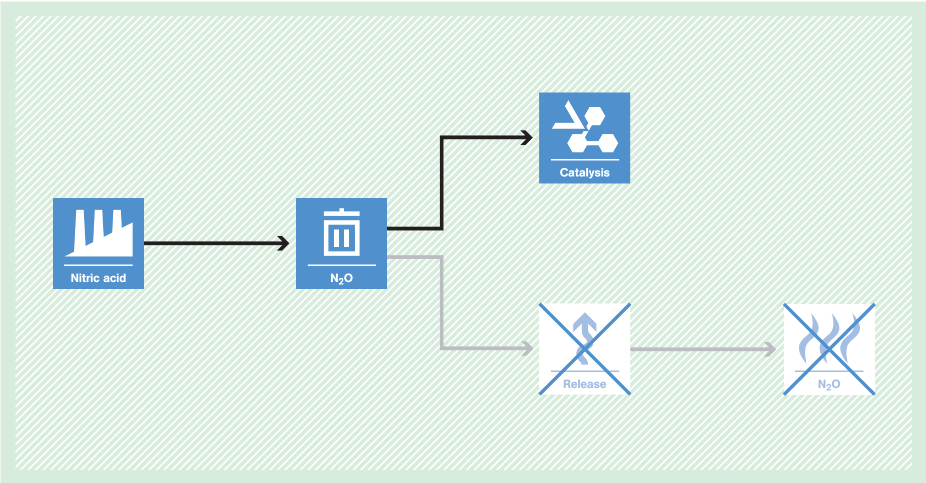
AM0030 PFC emission reductions from anode effect mitigation at primary aluminium smelting facilities

Typical project(s)	Implementation of anode effect mitigation measures at a primary aluminium smelter (e.g. improving the algorithm of the automatic control system for smelting pots).
Type of GHG emissions mitigation action	• GHG emission avoidance. Avoidance of PFC emissions by anode effect mitigation.
Important conditions under which the methodology is applicable	• The aluminium smelting facility started the commercial operation no later than December 31, 2002; • Minimum of three years of historical data is available on current efficiency, anode effect and aluminium production from December 31, 2002, onwards; • The aluminium smelting facility uses centre work pre-bake cell technology with bar brake (CWPB) or point feeder systems (PFPB); • The aluminium smelting facility has achieved an “operational stability associated to a PFC emissions level” that allows increasing the aluminium production by simply increasing the electric current in the pots.
Important parameters	Monitored: • If less than 95% of the anode effects are manually terminated: number and duration of anode effect; or over-voltage coefficient, anode effect over-voltage, and current efficiency; • Quantity of aluminium produced by the aluminium smelting facility.
BASELINE SCENARIO No mitigation of PFC emissions from anode effects at primary aluminium smelting facilities.	
PROJECT SCENARIO Implementation of anode effect mitigation measures to reduce PFC emissions from aluminium smelting.	

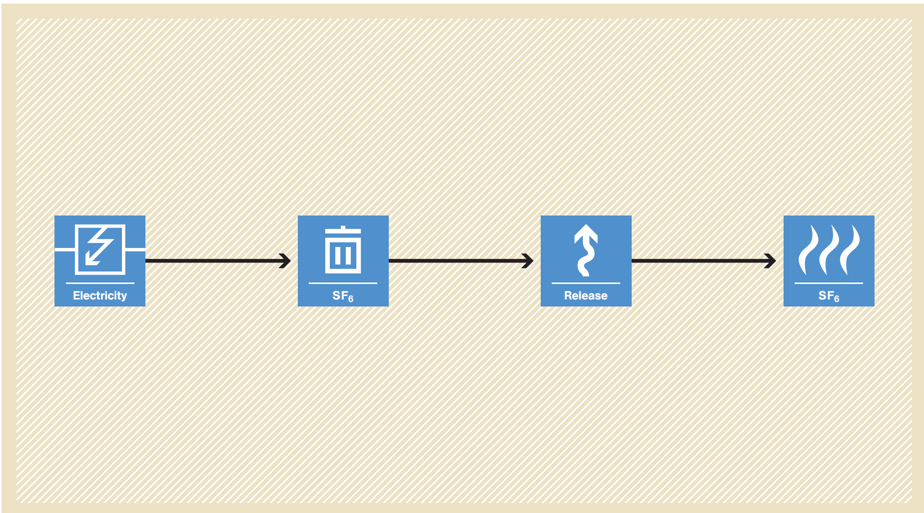
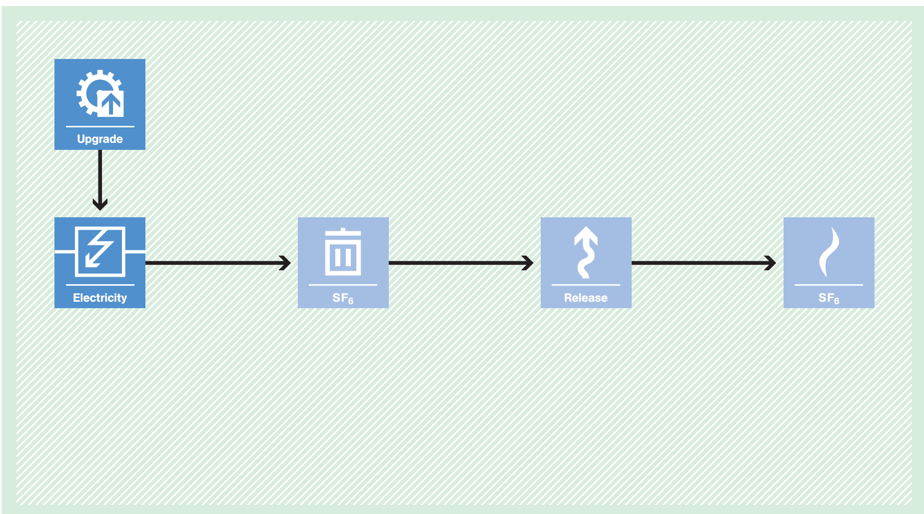
AM0031 Baseline methodology for bus rapid transit projects

Typical project(s)	Construction and operation of a new bus rapid transit system (BRT) for urban transport of passengers. Replacement, extensions or expansions of existing bus rapid transit systems (adding new routes and lines) are also allowed.
Type of GHG emissions mitigation action	• Energy efficiency. Displacement of more-GHG-intensive transportation modes.
Important conditions under which the methodology is applicable	• There is a plan to reduce existing public transport capacities either through scrapping, permit restrictions, economic instruments or other means and replacing them by the project system; • If gaseous fossil fuels are used, equal or more gaseous fossil fuels are used in the baseline scenario than in the project. If biofuels are used, project buses must use the same biofuel blend (same percentage of biofuel) as commonly used by conventional comparable urban buses in the country; • The project partially or fully replaces a traditional public transport system in a given city. The replacement of rail-based mass rapid transit systems is not allowed. The methodology cannot be used for BRT systems in areas where currently no public transport is available.
Important parameters	At validation: • Baseline distance and transport mode, which are obtained through a comprehensive survey involving the users of the project transport system; • Specific fuel consumption, occupancy rates and travelled distances of different transport modes (including the project); • Policies affecting the baseline (i.e. modal split of passengers, fuel usage of vehicles, maximum vehicle age). Monitored: • Number of passengers transported in the project.
BASELINE SCENARIO Passengers are transported using a diverse transport system involving buses, trains, cars, non-motorized transport modes, etc. operating under mixed traffic conditions.	
PROJECT SCENARIO Passengers are transported using the newly developed bus rapid transit system that partially displaces the existing transport system operating under mixed traffic conditions.	

AM0034 Catalytic reduction of N_2O inside the ammonia burner of nitric acid plants

Typical project(s)	Installation of a catalytic reduction unit inside an ammonia oxidation reactor of a nitric acid plant to destroy N_2O emissions.
Type of GHG emissions mitigation action	• GHG destruction. Catalytic destruction of N_2O emissions.
Important conditions under which the methodology is applicable	• The nitric acid plant started the commercial production no later than December 31, 2005; • At the start of the project, there are no regulatory requirements or incentives to reduce levels of N_2O emissions from nitric acid plants in the host country; • European Norm 14181 or an equivalent standard must be followed for real-time measurement of N_2O concentration and gas volume flow rate.
Important parameters	At validation: • Normal operating conditions of the plant (oxidation temperature and pressure, ammonia gas flow rate and ammonia to air ratio input to the ammonia oxidation reactor, composition of ammonia oxidation catalyst).
	Monitored: • Volume of tail gas flow; • N_2O concentration in the tail gas; • Nitric acid production; • Update of the parameters for determining the normal operation of the plant.
BASELINE SCENARIO N_2O is emitted into the atmosphere during the production of nitric acid.	
PROJECT SCENARIO N_2O is destroyed in a catalytic destruction unit installed inside the ammonia oxidation reactor.	

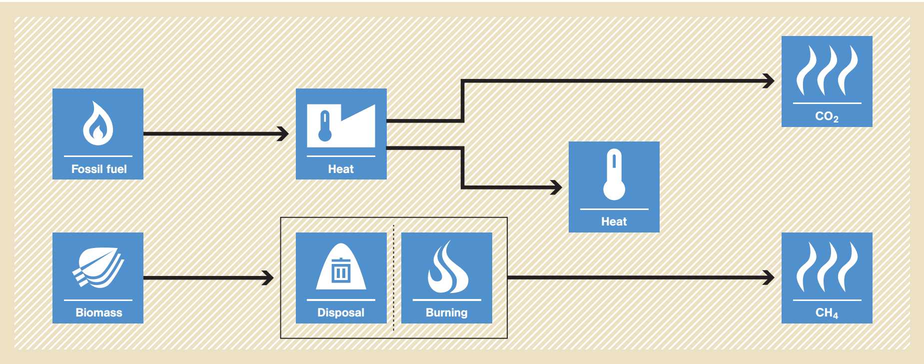
AM0035 SF_6 emission reductions in electrical grids

Typical project(s)	Recycling and/or leak reduction of SF_6 in a electricity grid.
Type of GHG emissions mitigation action	• GHG emission avoidance. Avoidance of SF_6 emissions by recycling and/or leak reduction.
Important conditions under which the methodology is applicable	• The project is implemented either in the entire grid or a verifiable distinct geographic portion of a grid; • Minimum of three years of historical data is available on the total SF_6 emissions from the grid.
Important parameters	At validation: • Net reduction in an SF_6 inventory for the grid; • Nameplate capacity (in kg SF_6) of equipment retired from and added to the grid.
	Monitored: • Update of the above parameters necessary for validation.
BASELINE SCENARIO SF_6 emitted from leaks and/or non-recycling of SF_6 during repair and maintenance of electricity transmission and distribution systems.	
PROJECT SCENARIO Recycling and/or leak-reduction of SF_6 during repair and maintenance of electricity transmission and distribution systems.	

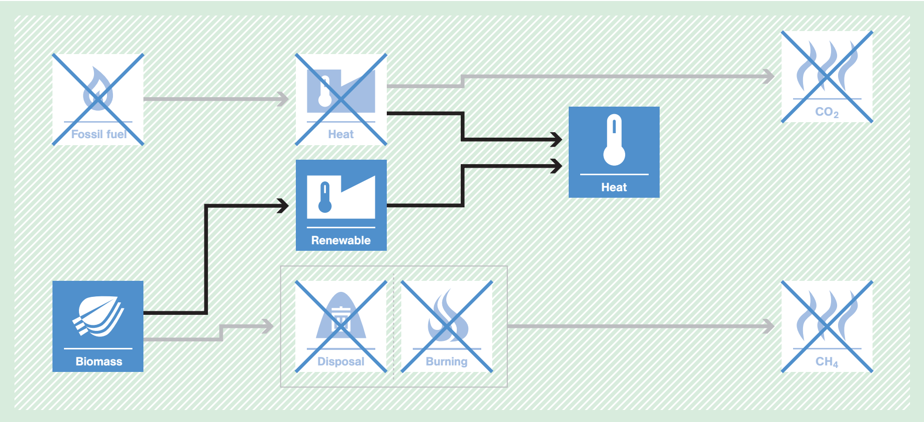
AM0036 Fuel switch from fossil fuels to biomass residues in heat generation equipment

Typical project(s)	Fuel switch from fossil fuels to biomass residues in the generation of heat. Applicable activities are retrofit or replacement of existing heat generation equipment and installation of new heat generation equipment.
Type of GHG emissions mitigation action	• Renewable energy; Displacement of more-GHG-intensive heat generation using fossil fuel and avoidance of CH_4 emissions from anaerobic decay of biomass residues.
Important conditions under which the methodology is applicable	• Heat generated in the project can only be used for power generation if power generation equipment was previously installed and is maintained throughout the crediting period; • Only biomass residues, not biomass in general, are eligible. No significant energy quantities except from transportation or mechanical treatment of the biomass residues should be required to prepare the biomass residues; • Existing heat generation equipment at the project site has either not used any biomass or has used only biomass residues (but no other type of biomass) for heat generation during the most recent three years prior to the implementation of the project; • In case of existing facilities, three years of historical data is required for the calculation of emissions reductions.
Important parameters	At validation: • Leakage due to diversion of biomass residues.
	Monitored: • Heat generated in the project; • Quantity and moisture content of the biomass residues used in the project as well as electricity and fossil fuel consumption of the project; • Project emissions from transport of biomass.

BASELINE SCENARIO
Heat would be produced by the use of fossil fuels. Biomass residues could partially decay under anaerobic conditions, bringing about CH_4 emissions.



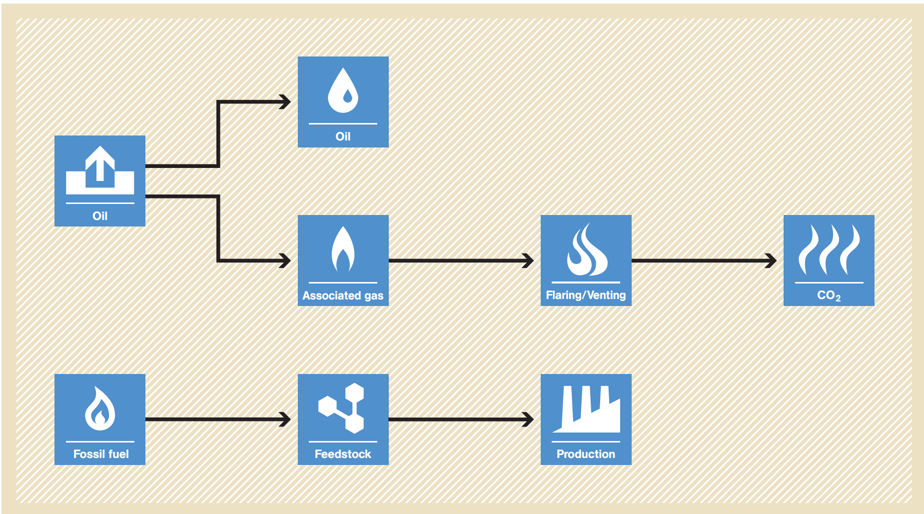
PROJECT SCENARIO
Use of biomass residues for heat generation avoids fossil fuel use and thereby GHG emissions. Decay of biomass residues used as fuel is avoided.



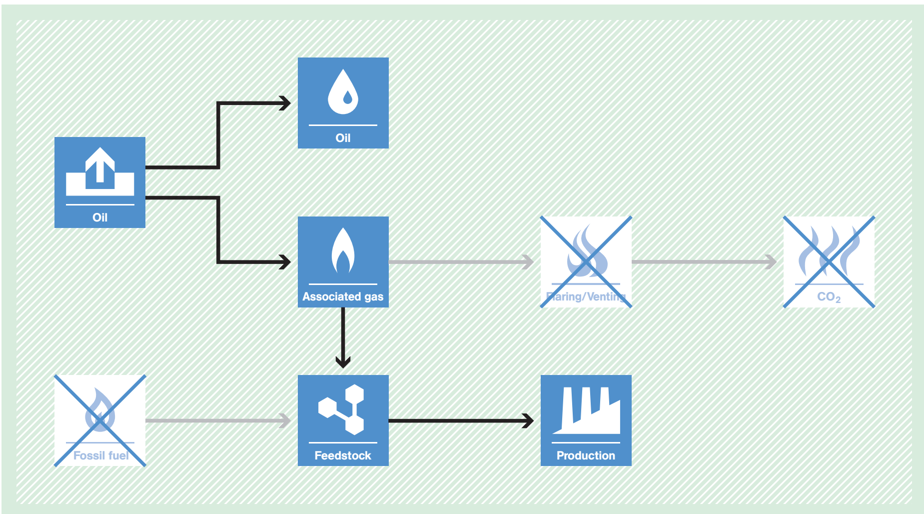
AM0037 Flare (or vent) reduction and utilization of gas from oil wells as a feedstock

Typical project(s)	Associated gas from oil wells that was previously flared or vented is recovered and utilized as a feedstock to produce a chemical product.
Type of GHG emissions mitigation action	• Feedstock switch. Avoidance of GHG emissions that would have occurred by flaring/venting the associated gas.
Important conditions under which the methodology is applicable	• The associated gas from the oil well, which is used in the project, was flared or vented for the last three years prior to the start of the project; • Under the project, the previously flared (or vented) associated gas is used as feedstock and, where applicable, partly as energy source in a chemical process to produce a useful product (e.g. methanol, ethylene or ammonia).
Important parameters	Monitored: • Mass fraction of methane in the associated gas; • Quantity of product(s) produced in the end-use facility in the project; • Quantity and carbon content of associated gas utilized in the project, i.e. the quantity of associated gas entering the pipeline for transport to the end-use facility.

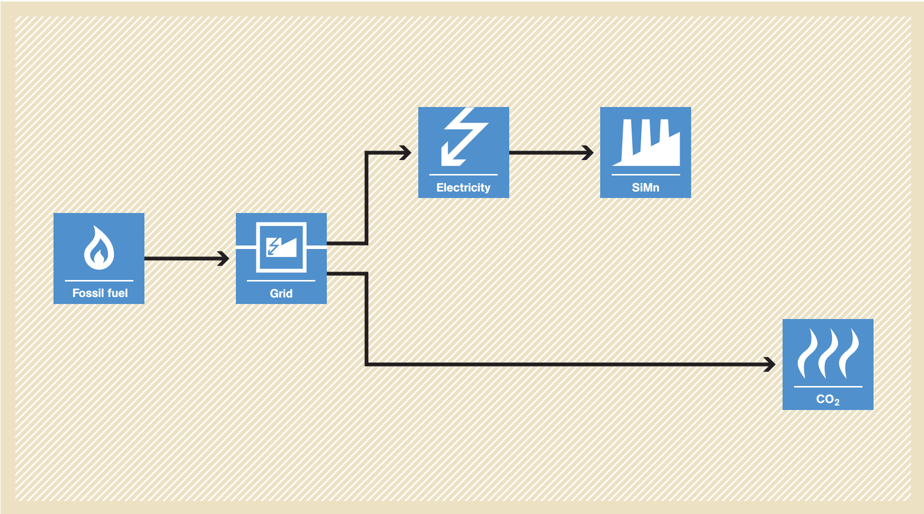
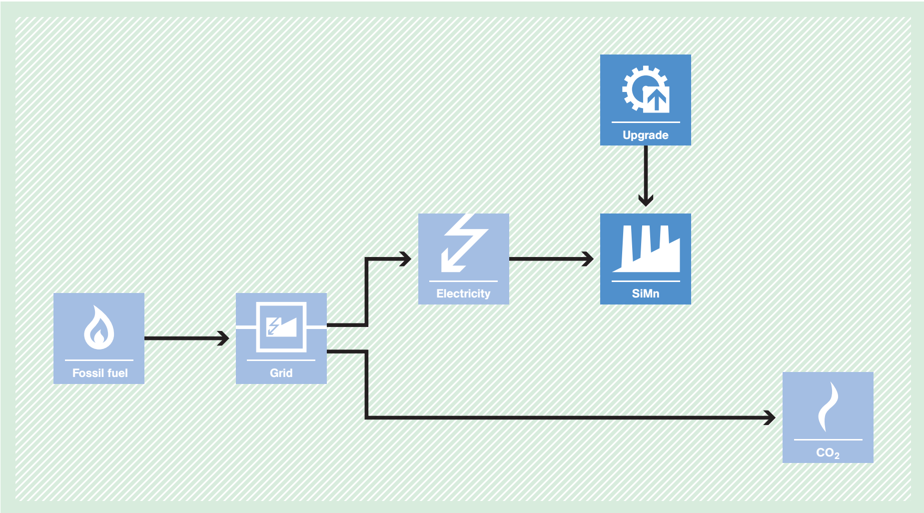
BASELINE SCENARIO
Associated gas from oil wells is flared or vented and other feedstock is used to produce a chemical product.



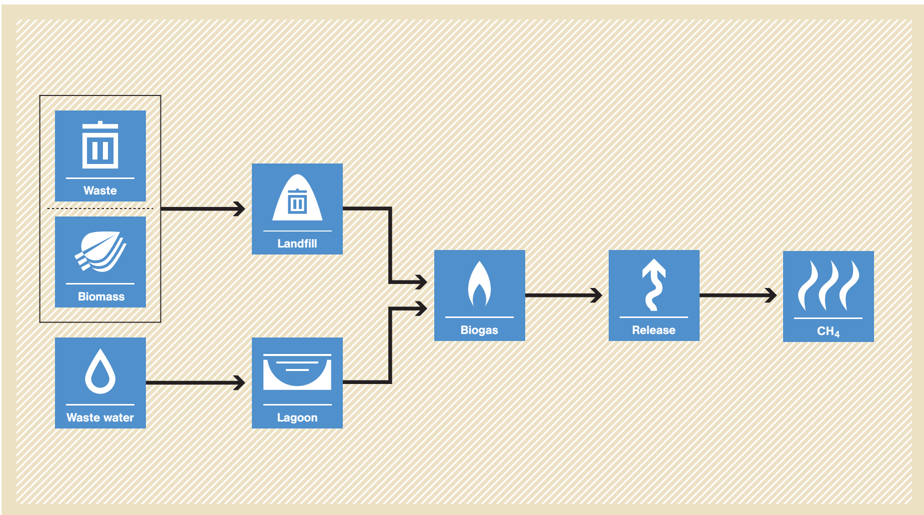
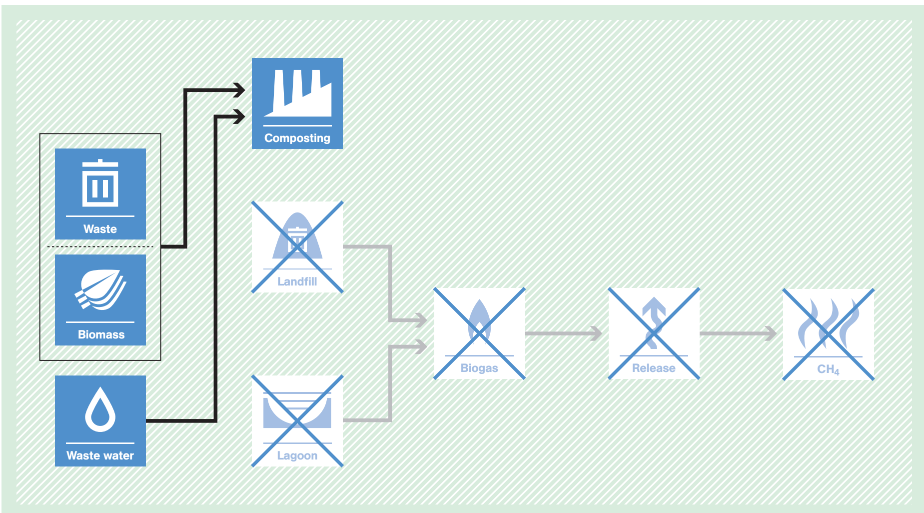
PROJECT SCENARIO
Associated gas from oil wells is recovered and utilized as feedstock to produce a chemical product.



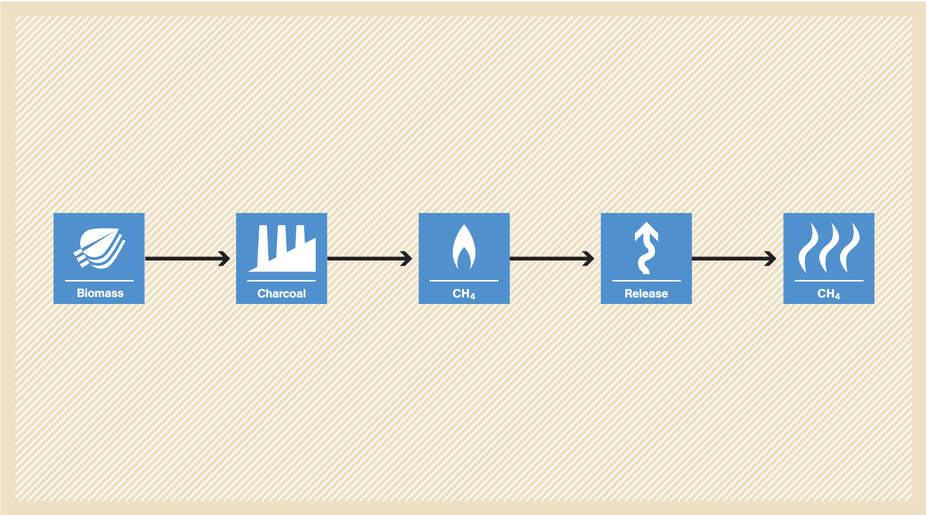
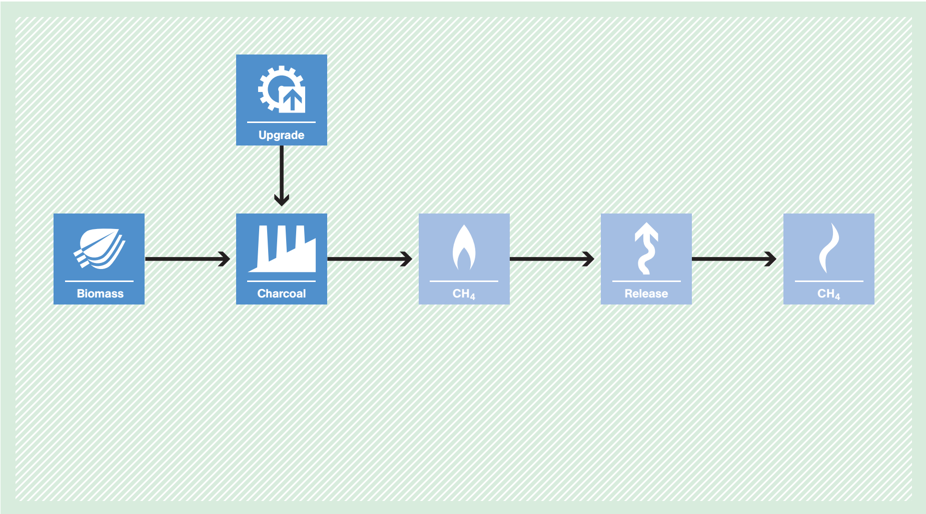
AM0038 Methodology for improved electrical energy efficiency of an existing submerged electric arc furnace used for the production of SiMn

Typical project(s)	Retrofitting of existing furnaces for the production of silicomanganese (SiMn) including control and peripheral systems with a more efficient system.
Type of GHG emissions mitigation action	• Energy efficiency; Switch to more energy-efficient technology.
Important conditions under which the methodology is applicable	• The electricity consumed is supplied by the grid; • The quality of the raw material and SiMn produced remains unchanged; • Data for at least three years preceding the implementing the project is available to estimate the baseline emission.
Important parameters	At validation: • Grid emission factor (can also be monitored ex post).
	Monitored: • SiMn production and consumption of electricity, coal, coke and electrode paste; • Project-specific quality and emission factors for coal, coke and electrode paste.
BASELINE SCENARIO Consumption of grid electricity in the submerged arc furnaces in SiMn plant results in CO_2 emissions from the combustion of fossil fuel used to produce electricity.	
PROJECT SCENARIO The more-efficient submerged arc furnaces in SiMn plant consume less electricity, and thereby, emissions from the combustion of fossil fuel used to produce electricity are reduced.	

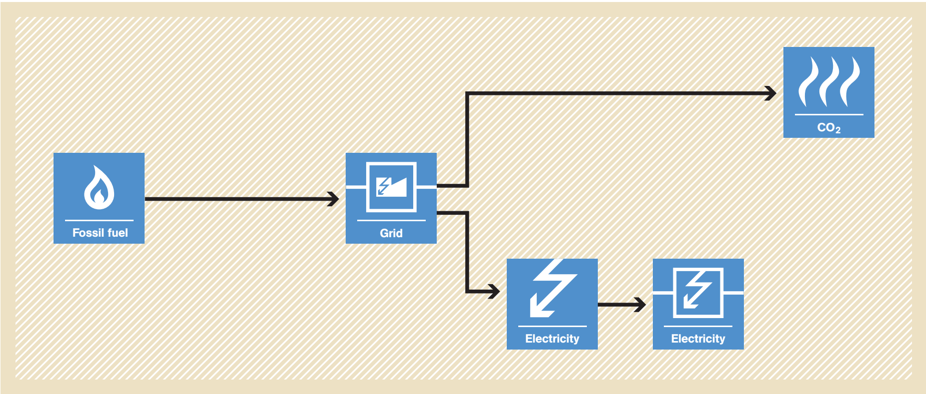
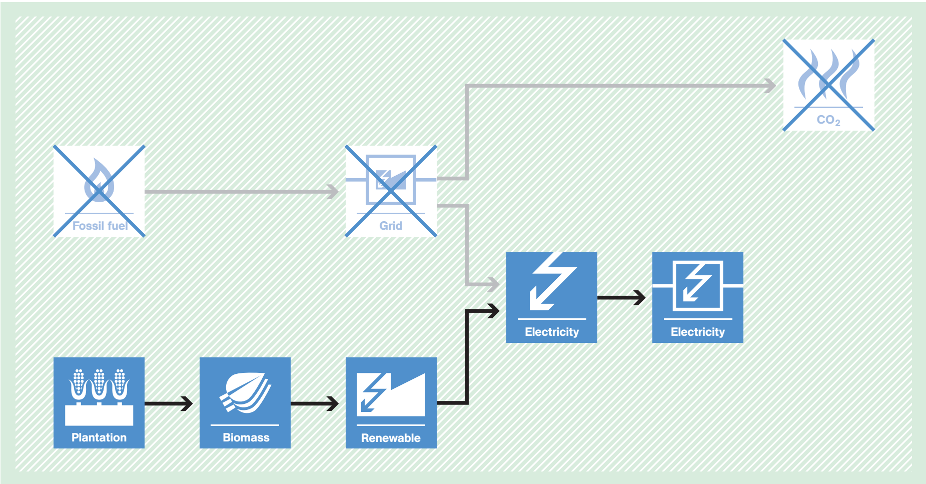
AM0039 Methane emissions reduction from organic waste water and bioorganic solid waste using co-composting

Typical project(s)	The methodology is applicable to projects that avoid CH_4 emissions resulting from anaerobic degradation of the organic wastewater in open lagoons or storage tanks or from natural decay of bioorganic solid waste in landfills (not from manure management).
Type of GHG emissions mitigation action	• GHG emission avoidance. The project avoids CH_4 emissions.
Important conditions under which the methodology is applicable	• Organic wastewater and bioorganic solid waste can be generated at separate locations; • Bioorganic solid waste can be of a single type or multiple types mixed in different proportions, provided the proportions can be determined; • A co-composting process is used to treat the organic wastewater and the bioorganic waste; • Anaerobic lagoons or storage tanks utilized for the treatment of the organic wastewater meet specified conditions for ambient temperature, depth and residence time.
Important parameters	Monitored: • Chemical oxygen demand of the wastewater; • Compost produced; • Organic waste landfilled; • Energy and transportation requirements of running the project.
BASELINE SCENARIO Landfilling of the bioorganic solid waste and wastewater treatment in an existing or new to be built anaerobic lagoon or open tanks results in CH_4 emissions.	
PROJECT SCENARIO Co-composting for treatment of the organic wastewater and the organic waste. CH_4 emissions due to anaerobic decay are avoided.	

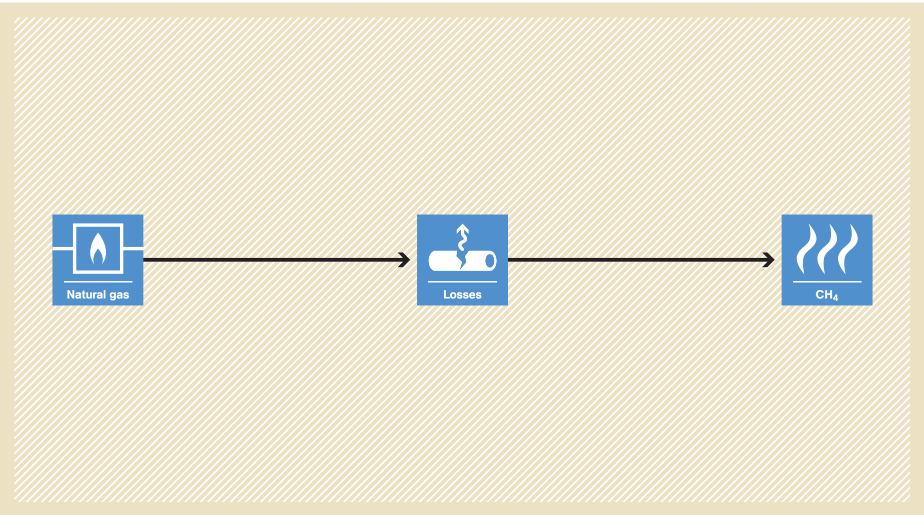
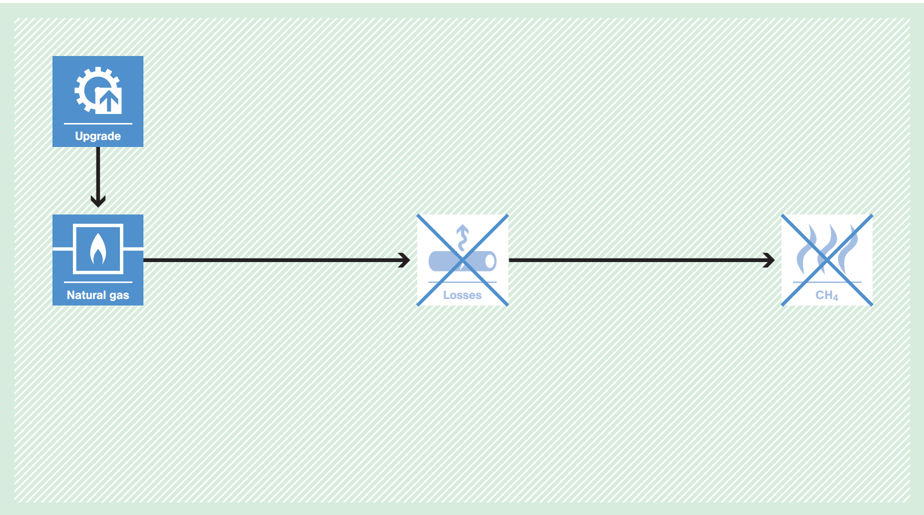
AM0041 Mitigation of methane emissions in the wood carbonization activity for charcoal production

Typical project(s)	Existing carbonization kilns are improved with new kiln design and changes in operational practices that reduce the CH_4 emissions in the production of charcoal.
Type of GHG emissions mitigation action	• GHG emission avoidance. Avoidance or reduction of CH_4 emissions in charcoal production process.
Important conditions under which the methodology is applicable	• Regulation for CH_4 emissions in charcoal production either doesn't exist, or is less stringent than the project, or lacks of enforcement; • The project does not affect GHG emissions other than methane; • The project does not change the type and sources for input for charcoal production.
Important parameters	Monitored: • Quantity and moisture content of charcoal produced in the project; • Quantity and moisture content of wood used in the carbonization process in the project.
BASELINE SCENARIO High CH_4 emissions associated with the production of charcoal.	
PROJECT SCENARIO Decreased or avoided CH_4 emissions associated with production of charcoal.	

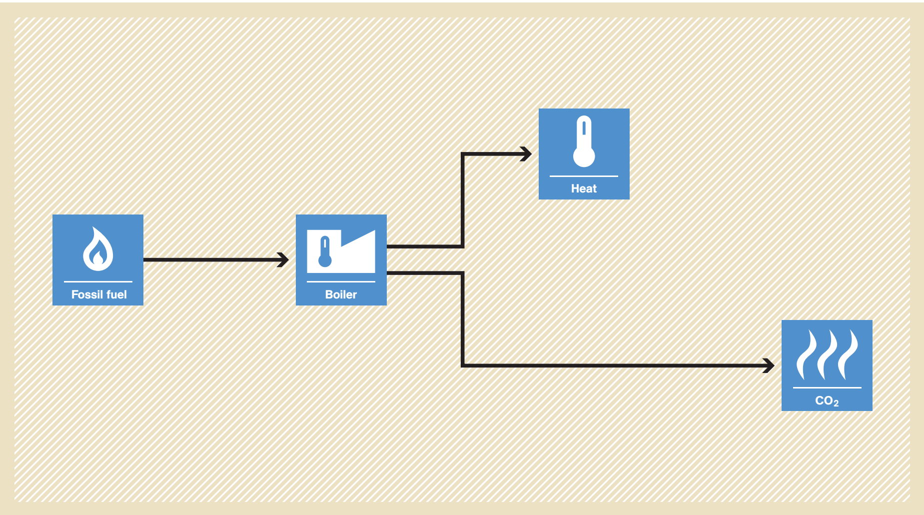
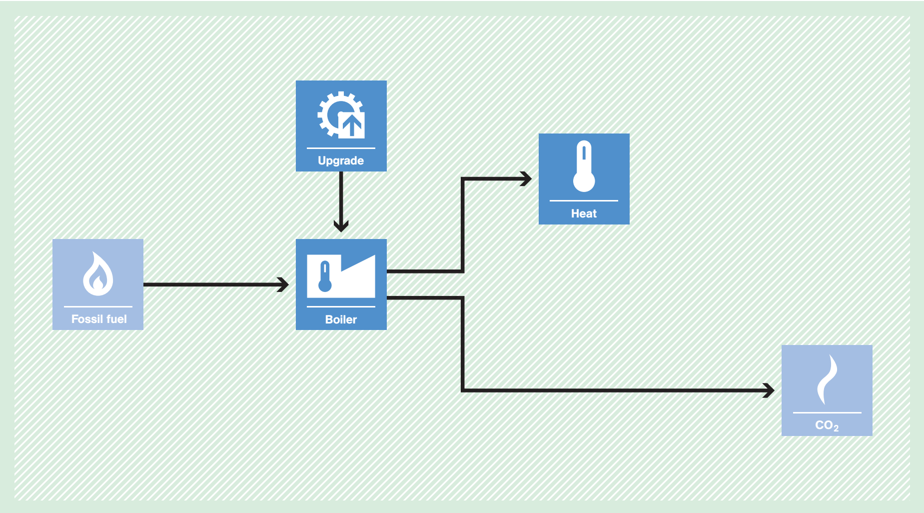
AM0042 Grid-connected electricity generation using biomass from newly developed dedicated plantations

Typical project(s)	Installation of a new grid-connected power plant that is mainly fired with renewable biomass from a dedicated plantation (fossil fuel or other types of biomass may be co-fired).
Type of GHG emissions mitigation action	• Renewable energy. Displacement of electricity that would be provided by more-GHG-intensive means.
Important conditions under which the methodology is applicable	• Prior to the implementation of the project, no power was generated at the project site (i.e. the project plant does not substitute or affect the operation of any existing power generation at the project site); • The dedicated plantation must be newly established as part of the project for the purpose of supplying biomass exclusively to the project; • The biomass from the plantation is not chemically processed (e.g. no production of alcohols from biomass, etc.) prior to combustion in the project plant but it may be processed mechanically or be dried; • Grazing or irrigation for the plantation is not allowed; • The land area where the dedicated plantation will be established has not been used for any agricultural or forestry activity prior to the project implementation.
Important parameters	At validation: • Grid emission factor (can also be monitored ex post).
	Monitored: • Electricity generated in the project; • Electricity and fossil fuel consumption of the project as well as quantity, net calorific value and moisture content of the biomass used in the project.
BASELINE SCENARIO Electricity produced by more-GHG-intensive power plants connected to the grid.	
PROJECT SCENARIO Electricity produced by a grid-connected biomass-fired power plant.	

AM0043 Leak reduction from a natural gas distribution grid by replacing old cast iron pipes or steel pipes without cathodic protection with polyethylene pipes

Typical project(s)	Installation of polyethylene pipes for the early replacement of leaking cast iron pipes or steel pipes without cathodic protection in a natural gas distribution network.
Type of GHG emissions mitigation action	• GHG emissions avoidance. Avoidance of CH_4 emissions from leaks in natural gas transportation.
Important conditions under which the methodology is applicable	• The project replaces either cast iron pipes or steel pipes without cathodic protection that have been in use for 30 years with polyethylene pipes without altering the pattern and supply capacity of the system; • The replacement is not part of normal repair and maintenance, planned replacement, or due to interruptions or shortages or a switch from servicing other gases; • The distribution system does not include gas transmission pipelines or storage facilities.
Important parameters	At validation: • Length of pipes and number of leaks (alternative: leakage rate of the section).
	Monitored: • Length of new pipeline due to both project and procedural replacement; • Fraction of methane in the natural gas; • Pressure of natural gas in the network.
BASELINE SCENARIO Methane leaks from a natural gas network.	
PROJECT SCENARIO No leaks or fewer leaks in the natural gas network.	

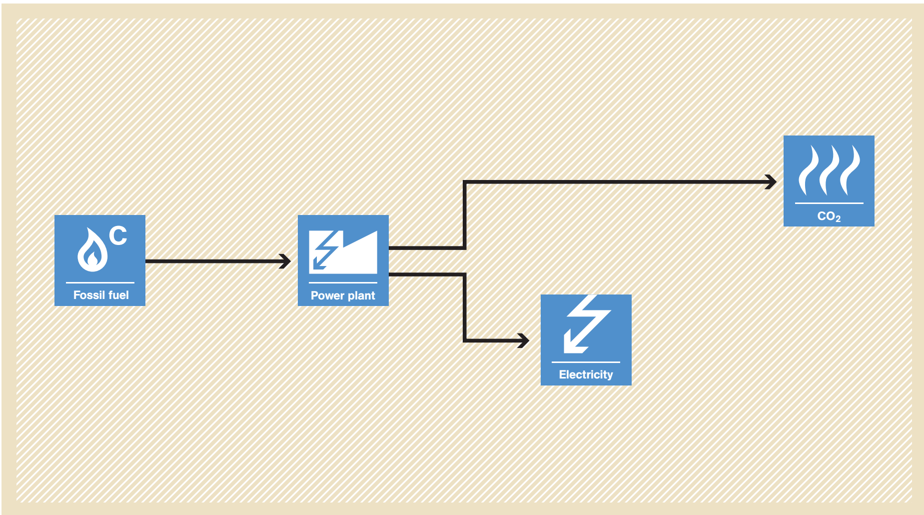
AM0044 Energy efficiency improvement projects: boiler rehabilitation or replacement in industrial and district heating sectors

Typical project(s)	Projects that results in thermal energy efficiency improvement of fossil-fuel-fired boilers, at multiple locations, through rehabilitation or replacement of the boilers implemented by the project participant, who may be the owner of boilers or owner of all the sites or part of the sites where the boilers are to be installed or a third party that owns all the project boilers during the project period.
Type of GHG emissions mitigation action	• Energy efficiency. Switch to more energy-efficient technology.
Important conditions under which the methodology is applicable	• The boilers that are rehabilitated or replaced under the project should have some remaining lifetime; • Only one type of fuel is used by each of the boilers included in the project boundary and no fuel switching is undertaken within the project boundary, as a part of project; • The installed capacity of each boiler shall be determined using a performance test in accordance with well-recognized international standards.
Important parameters	Monitored • Amount of fossil fuel consumed, net calorific value of fossil fuel, emission factor of fossil fuel, oxidation factor of fossil fuel in each boiler in the project. • Total thermal output of each boiler in the project.
BASELINE SCENARIO Boiler(s) with lower efficiency will continue to operate at multiple locations, thereby consuming high amounts of fossil fuel.	
PROJECT SCENARIO The efficiency of boiler(s) is improved through their rehabilitation or replacement, resulting in a reduction of fossil fuel consumption and related CO_2 emissions.	

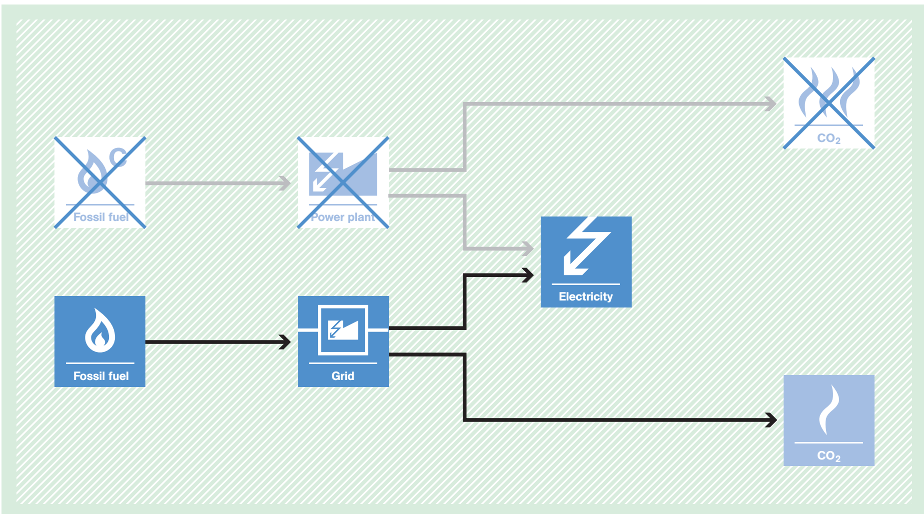
AM0045 Grid connection of isolated electricity systems

Typical project(s)	Expansion of an interconnected grid to supply electricity generated by more-efficient, less-carbon-intensive means to an isolated electric power system.
Type of GHG emissions mitigation action	• Fuel switch. Displacement of electricity that would be provided by more-GHG-intensive means.
Important conditions under which the methodology is applicable	• Renewable energy based electricity generation in the isolated systems is not displaced and its operation is not significantly affected; • All fossil-fuel-fired power plants in the isolated system are 100% displaced.
Important parameters	At validation: • Grid emission factor of isolated system before start of the project; • Electricity supplied to isolated system before start of the project (three years of historic data required). Monitored: • Quantity of electricity supplied to the previously isolated system by the interconnected grid; • Grid emission factor of the interconnected grid.

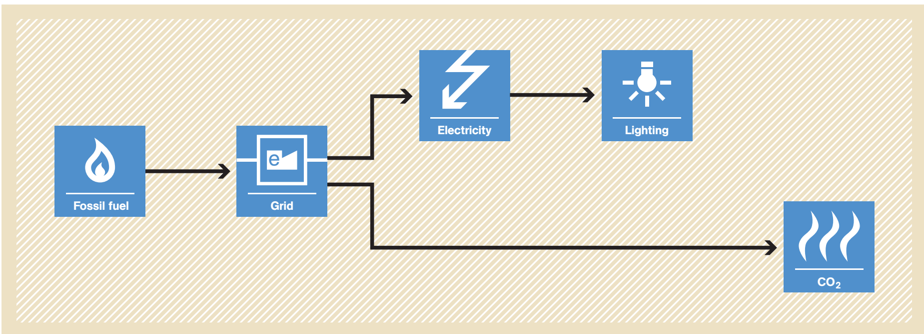
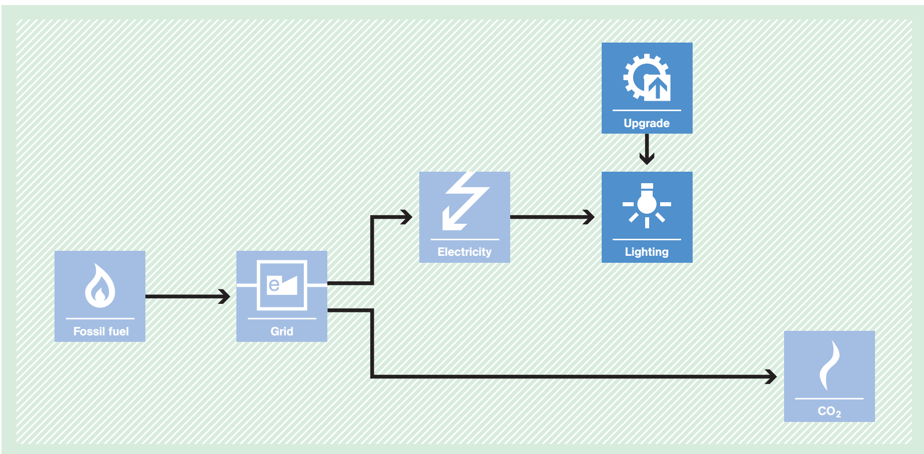
BASELINE SCENARIO
Power generation based on fossil fuel applying less-efficient technologies in isolated electricity systems.



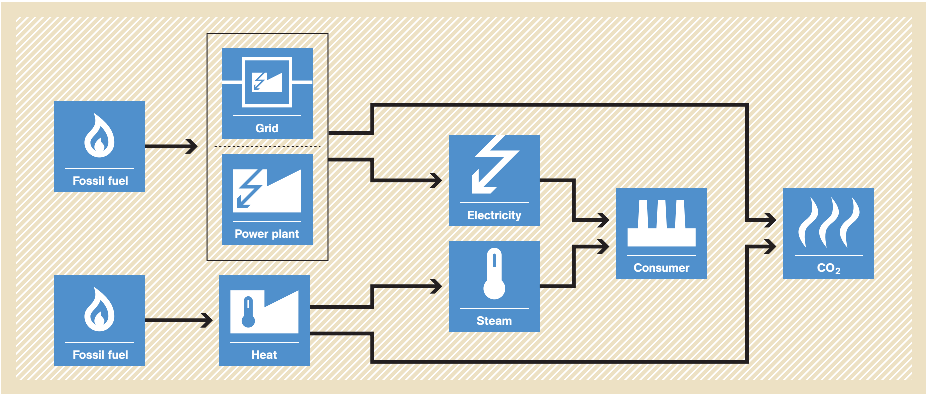
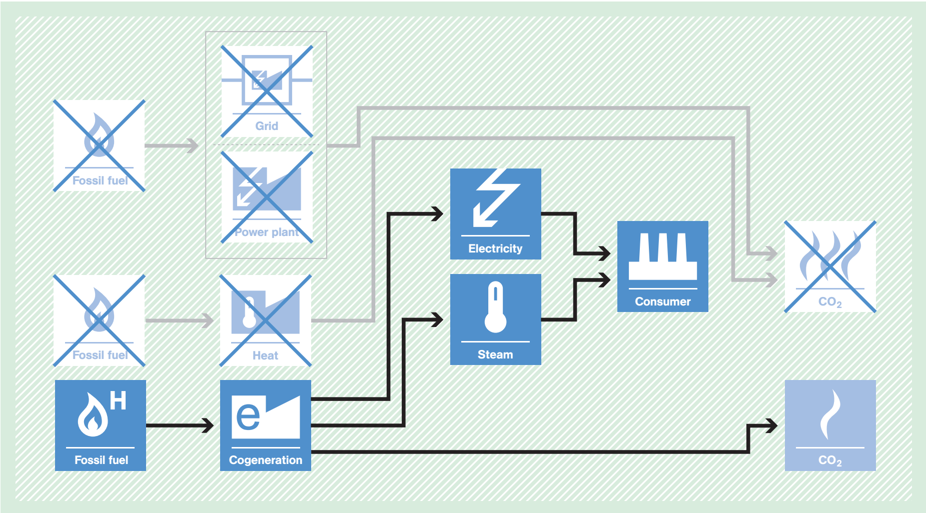
PROJECT SCENARIO
Displacement of fossil-fuel-fired power plants in the isolated grid by expansion of an interconnected grid to the isolated electricity system.



AM0046 Distribution of efficient light bulbs to households

Typical project(s)	Compact fluorescent lamps (CFLs) are sold at a reduced price, or donated to households to replace incandescent lamps (ICL).
Type of GHG emissions mitigation action	• Energy efficiency. Displacement of less-efficient lighting by more-efficient technology.
Important conditions under which the methodology is applicable	• The households are within a distinct geographical area and are connected to the electricity grid and no other CDM project that may affect the energy efficiency of lighting in households located within the total project area has been registered; • A maximum of four CFLs can be distributed or sold to each household and these CFLs have to be more efficient and have the same or a lower lumen output as the previously used ICL; • The displaced light bulbs have a maximum rated power of 100 W and are returned to the project coordinator, who ensures destruction of the light bulbs; • Electricity consumption from lighting has to be monitored in a baseline sample group (BSG) and a project sample group (PSG). The project coordinator implements a social lottery system as an incentive among all households included in the BSG and the PSG.
Important parameters	At validation: • The average grid voltage in the low-voltage part of the grid, the power rating and the P-U characteristic curve of the distributed light are determined before the start of the project; • Grid emission factor (alternatively monitored).
	Monitored: • Electricity consumed to provide lighting (or utilization hours and power rating of lighting appliance) for household within the BSG and PSG; • Number of project ICL and scrapped light bulbs; • Technical distribution losses in the grid.
BASELINE SCENARIO Less-energy-efficient light bulbs are used in households resulting in higher electricity demand.	
PROJECT SCENARIO More-energy-efficient CFLs are used in households saving electricity and thus reducing GHG emissions.	

AM0048 New cogeneration facilities supplying electricity and/or steam to multiple customers and displacing grid/off-grid steam and electricity generation with more carbon-intensive fuels

Typical project(s)	Fossil-fuel-fired cogeneration project supplying to multiple project customers.
Type of GHG emissions mitigation action	• Energy efficiency; • Fuel switch. Switch to cogeneration of steam and electricity and displacement of more-carbon-intensive fuel with less-carbon-intensive fuel.
Important conditions under which the methodology is applicable	• Cogeneration of steam and electricity and supply to multiple users who did not previously co-generate; • Minimum three years of historical data for estimating baseline emissions; • Equipment displaced by the project is to be scrapped; • Project customers should not demand electricity and/or heat from external sources, other than the project or the grid.
Important parameters	At validation: • Historical fuel consumption and steam production/consumption.
	Monitored: • Electricity emission factor; • Quantity of electricity consumed by each project customer, from the project and from self-generation; • Quantity, temperature, specific enthalpy and pressure of steam consumed by each project customer, from the project and from self-generation • Quantity of electricity supplied to the grid • Quantity of fuel consumed by the project.
BASELINE SCENARIO Separate steam and electricity production with more-GHG-intensive fuel.	
PROJECT SCENARIO Cogeneration of electricity and steam with less-carbon-intensive fuel (e.g. natural gas).	

AM0049 Methodology for gas based energy generation in an industrial facility

Typical project(s)

Installation of gas-based energy generation systems, either separate or cogeneration, at an existing industrial facility to meet its own electricity and/or steam/heat demand.

Type of GHG emissions mitigation action

- Fuel switch;
- Energy efficieny.

Displacement of more-carbon-intensive fuel with less-carbon-intensive fuel.

Important conditions under which the methodology is applicable

- Prior to the project implementation, the existing industrial facility produces its own thermal energy and maybe electricity, but the electricity supply is not enough to meet its own demand;
- Coal or oil is replaced by natural gas or methane-rich gas, which shall be sufficiently available in the region or country;
- There are no regulatory requirements for fuel switch or technology upgrade;
- The project does not change the quality requirement of steam/heat;
- Electricity export to the power grid, if any, is on ad-hoc basis and consists of less than 10% of the total electricity produced by the project power plant.

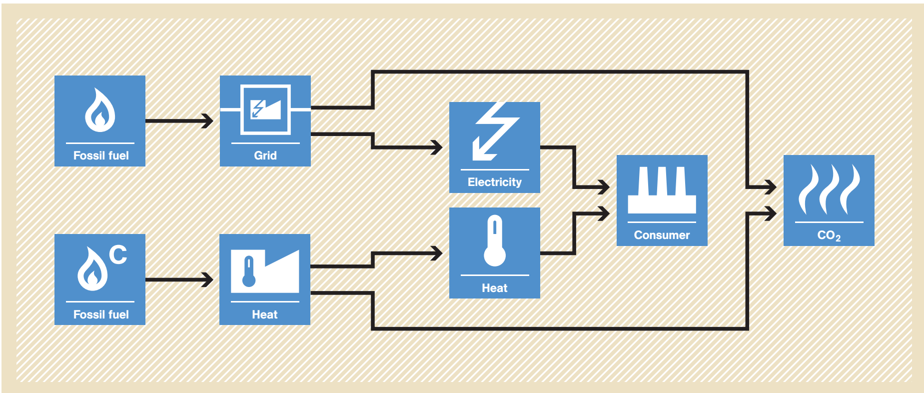
Important parameters

Monitored:

- Grid emission factor;
- Electricity generation and export of the project power plant;
- Efficiency of the baseline and project fuel combustion systems;
- Flow rate, pressure and temperature of heat carrier at inlet and outlet of waste heat generation sources;
- Fuel consumption by the project plant.

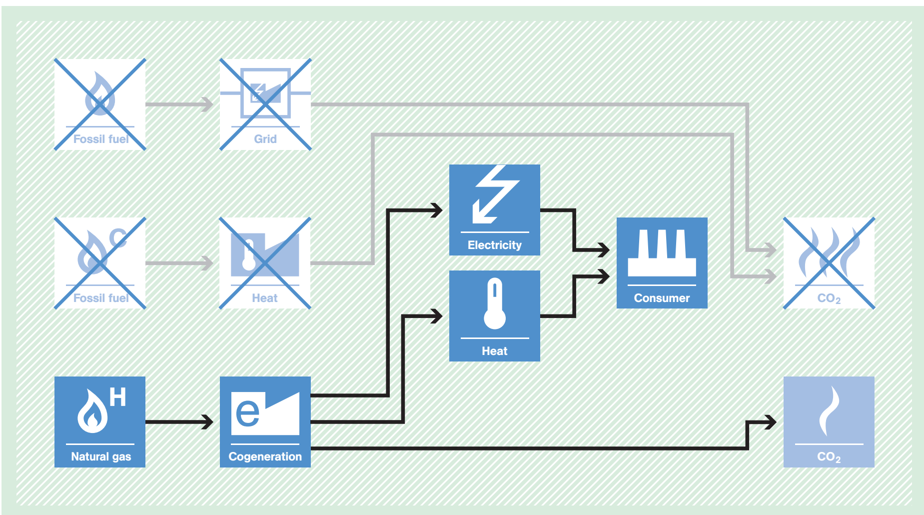
BASELINE SCENARIO

On-site generation of heat using coal or oil and import of electricity from the grid.



PROJECT SCENARIO

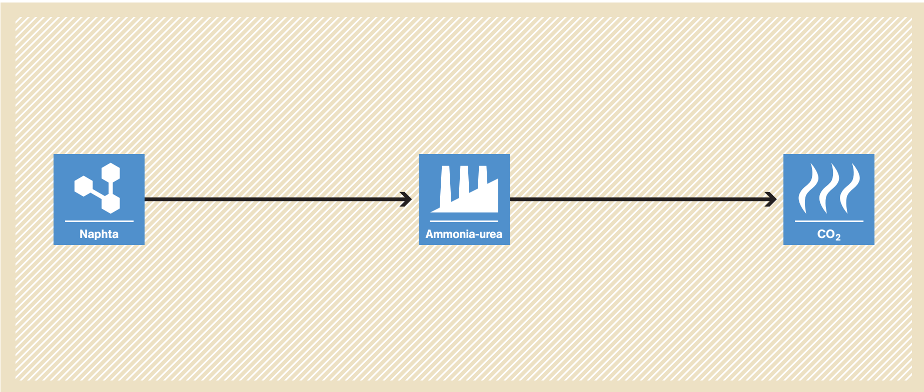
Installation of energy generation systems, either separate or cogeneration, to supply electricity and/or steam/heat using natural gas or methane-rich gas.



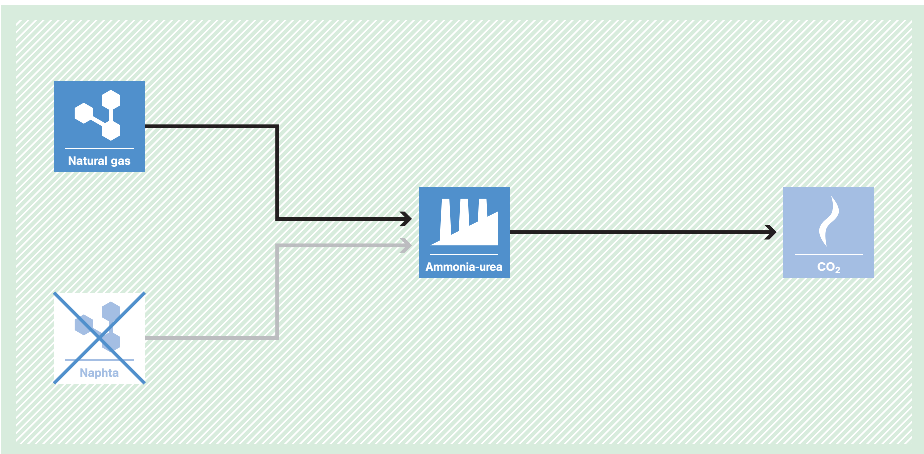
AM0050 Feed switch in integrated ammonia-urea manufacturing industry

Typical project(s)	Feed switch from naphtha to natural gas, either completely or partially, in existing integrated ammonia-urea manufacturing facilities, with optional implementation of a CO_2 recovery plant within the manufacturing facility.
Type of GHG emissions mitigation action	• Feedstock switch. Displacement of more-GHG-intensive feedstock (naphtha) with less-GHG-intensive feedstock (natural gas).
Important conditions under which the methodology is applicable	• The project should not result in the increase of the production capacity and change in production process; • Natural gas is sufficiently available in the region or country; • The integrated ammonia-urea manufacturing plant is an existing plant with a historical operation of at least three years prior to the implementation of the project; • Prior to the implementation of the project, no natural gas has been used in the integrated ammonia-urea manufacturing plant.
Important parameters	At validation: • Urea production in the most recent three years; • Quantity of naphtha used as feed in the most recent three years; • Quantity of fuel consumed in furnaces in the most recent three years.
	Monitored: • Urea production in the project; • Quantity of natural gas used as feed in the project; • Quantity of fuel consumed in furnaces in the project; • Quantity and CO_2 emission factor of electricity consumed by the CO_2 recovery plant.

BASELINE SCENARIO
The integrated ammonia-urea manufacturing plant continues to use naphtha as the feed emitting excess CO_2, not used by the urea plant, into atmosphere.



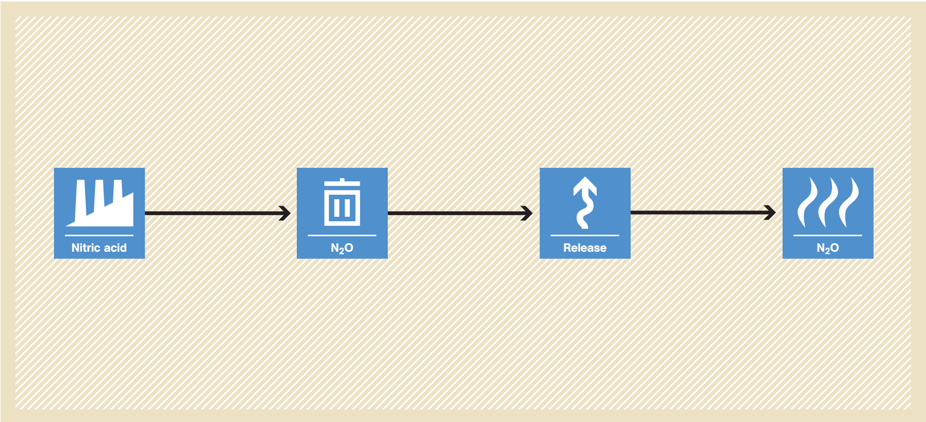
PROJECT SCENARIO
The feed to the integrated ammonia-urea manufacturing plant is switched from naphtha to natural gas, if required in combination with the implementation of a CO_2 recovery, to reduce the emission of excess CO_2.



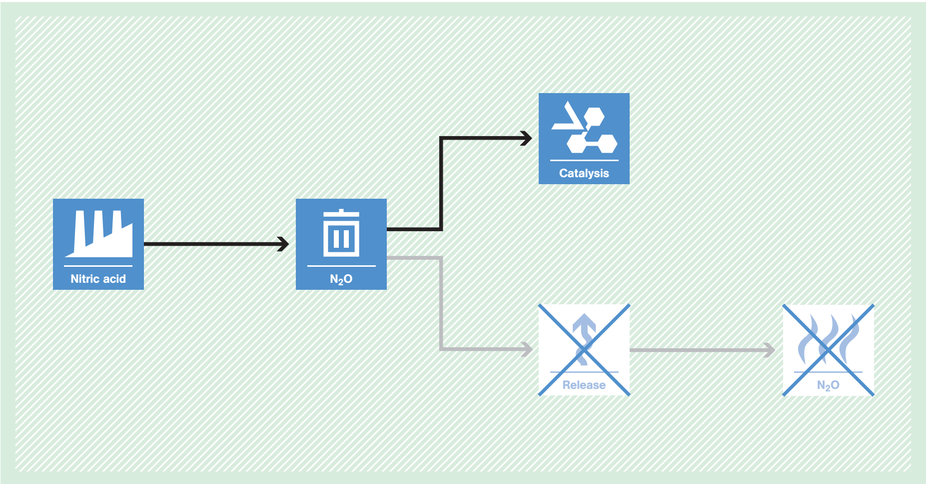
AM0051 Secondary catalytic N_2O destruction in nitric acid plants

Typical project(s)	Installation of a catalytic reduction unit inside an ammonia oxidation reactor of a nitric acid plant to destroy N_2O emissions.
Type of GHG emissions mitigation action	• GHG destruction. Catalytic destruction of N_2O emissions.
Important conditions under which the methodology is applicable	• The nitric acid plant stated the commercial production no later than December 31, 2005; • At the start of the project, there are no regulatory requirements or incentives to reduce levels of N_2O emissions from nitric acid plants in the host country; • European Norm 14181 or an equivalent standard must be followed for real-time measurement of N_2O concentration and gas volume flow rate.
Important parameters	At validation: • Normal operating conditions of the plant (oxidation temperature and pressure, ammonia gas flow rate and ammonia to air ratio input to the ammonia oxidation reactor, composition of ammonia oxidation catalyst).
	Monitored: • Volume of gas flow inside the ammonia oxidation reactor; • N_2O concentration in the tail gas; • N_2O concentration in the process gas immediately after the primary catalyst; • N_2O concentration in the process gas after the secondary catalyst; • Update of the parameters for determining the normal operation of the plant.

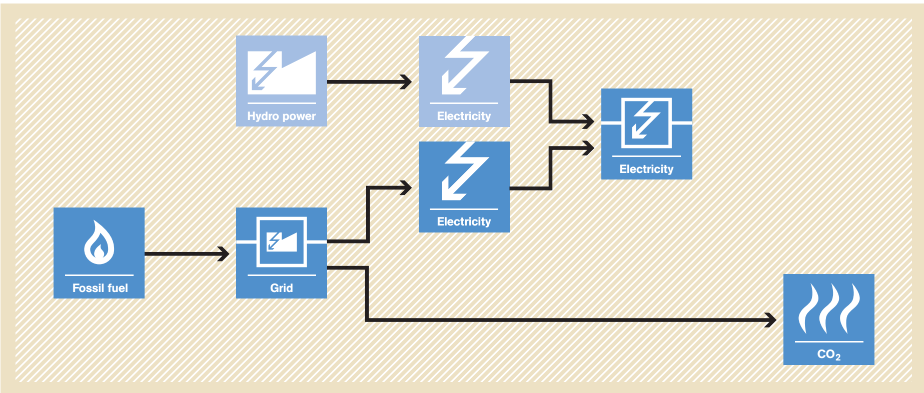
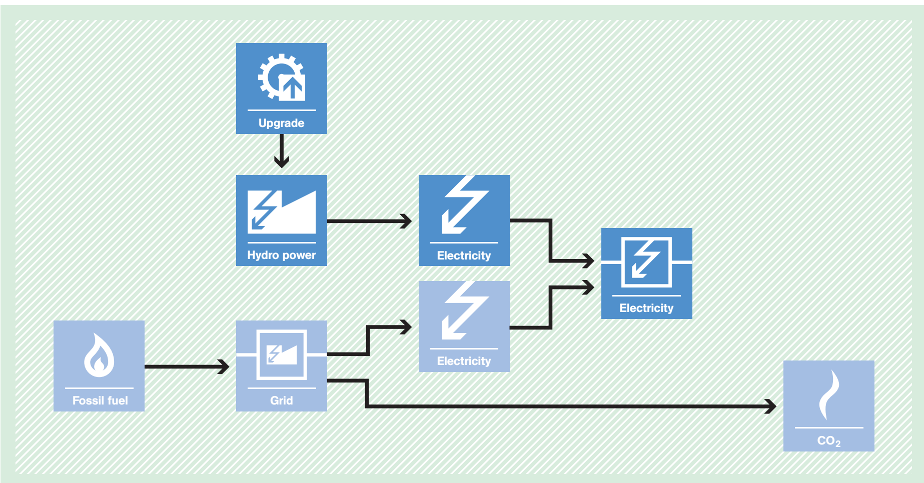
BASELINE SCENARIO
N_2O is emitted into the atmosphere during the production of nitric acid.



PROJECT SCENARIO
N_2O is destroyed in a catalytic destruction unit installed inside the ammonia oxidation reactor.



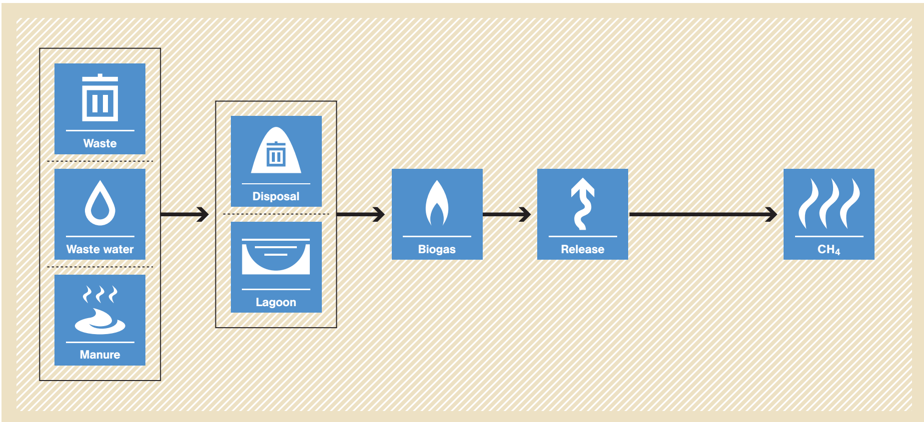
AM0052 Increased electricity generation from existing hydropower stations through decision support system optimization

Typical project(s)	Increased annual generation of electricity through the introduction of a Decision Support System (DSS) that optimizes the operation of the existing hydropower facility/ies, both run-of-the-river and reservoir-based type, connected to a grid.
Type of GHG emissions mitigation action	• Renewable energy. Displacement of electricity that would have been provided by more-GHG-intensive means.
Important conditions under which the methodology is applicable	• Recorded data is available for a minimum of three years to establish the baseline relationship between water flow and power generation; • Hydropower units, covered under the project, have not undergone and will not undergo significant upgrades beyond basic maintenance (e.g. replacement of runners) that affect the generation capacity and/or expected operational efficiency levels during the crediting period; • No major changes in the reservoir size (e.g. increase of dam height) or to other key physical system elements (e.g. canals, spillways) that would affect water flows within the project boundary, have been implemented during the baseline data period or will be implemented during the crediting period;
Important parameters	At validation: • Grid emission factor (can also be monitored ex post); • Measurement data of headwater level, vertical opening of spillway, power output etc. from previous year before project implementation as well as power polynomial coefficients (hill diagram).
	Monitored: • Quantity of electricity generated by each hydropower unit in the project.
BASELINE SCENARIO Additional electricity would be produced by more-GHG-intensive power plants connected to the grid.	
PROJECT SCENARIO Introduction of a Decision Support System (DSS) increases the supply of electricity generated by existing hydropower units to the grid, thereby reducing the amount of more-GHG-intensive electricity in the grid.	

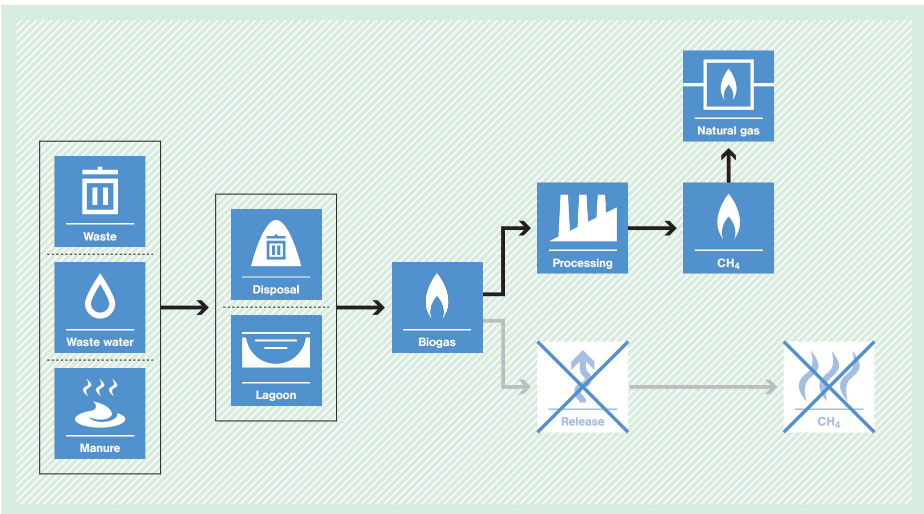
AM0053 Biogenic methane injection to a natural gas distribution grid

Typical project(s)	Recovering, processing and upgrading of biogas, generated by anaerobic decomposition of organic matter in landfills, wastewater treatment systems, animal waste management systems, etc., to the quality of natural gas and distributing it as energy source via a natural gas distribution grid.
Type of GHG emissions mitigation action	• Renewable energy. Avoidance of CH_4 emissions and displacement of use of natural gas in a natural gas distribution grid.
Important conditions under which the methodology is applicable	• The biogas was either vented or flared prior to implementation of the project activity and would continue to be either vented or flared in the absence of the project; • The geographical extent of the natural gas distribution grid is within the host country; • The following technologies are used to upgrade biogas to natural gas quality: pressure swing adsorption, absorption with/without water circulation or absorption with water, with or without water recirculation.
Important parameters	Monitored: • Quantity and net calorific value of upgraded biogas injected to the natural gas distribution grid in the project; • Quantity of biogas captured at the source of biogas generation; • Concentration of methane in biogas at the source of biogas generation; • Quantity of biogas delivered to the upgrading facility from the biogas capture site.

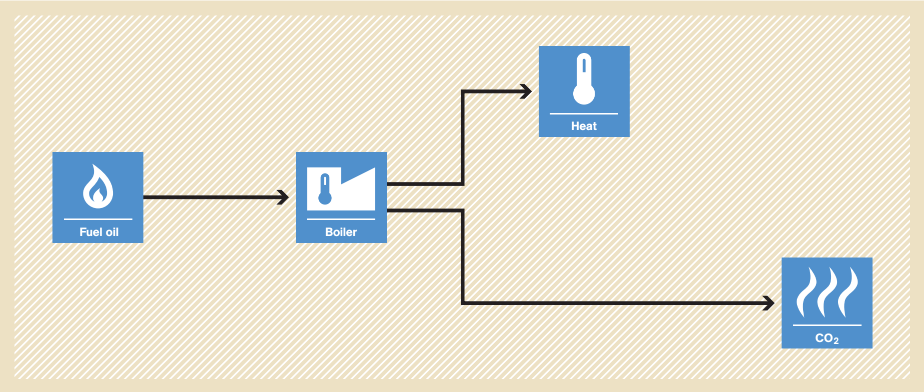
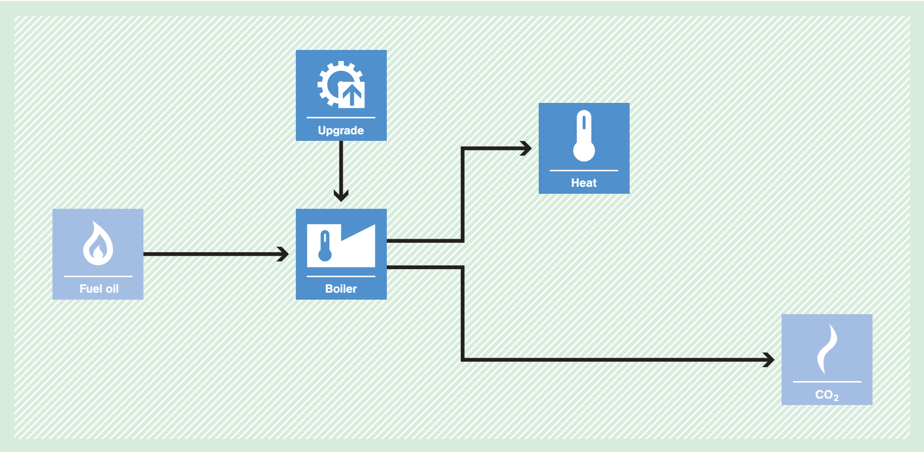
BASELINE SCENARIO
Biogas is vented or flared and natural gas distribution grid is supplied by natural gas extracted from gas wells.



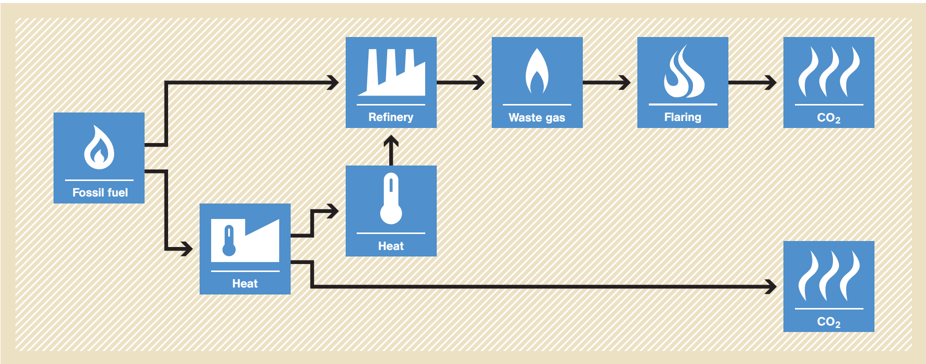
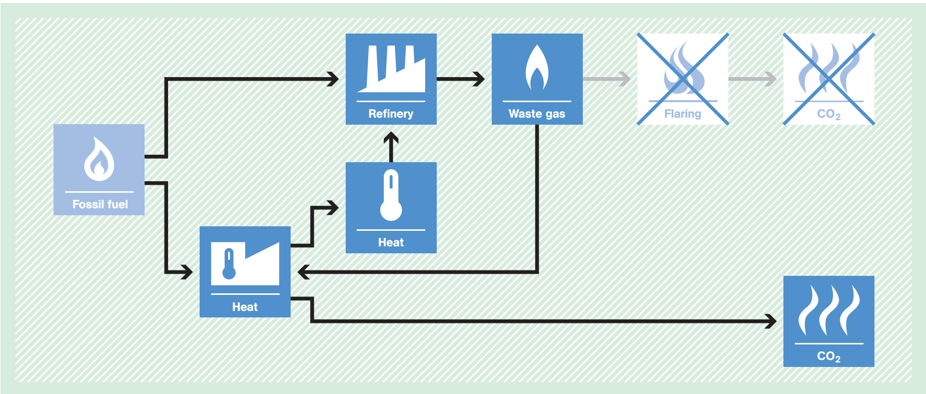
PROJECT SCENARIO
Biogas is recovered, processed, upgraded and supplied to the natural gas distribution grid and replaces additional natural gas from gas wells.



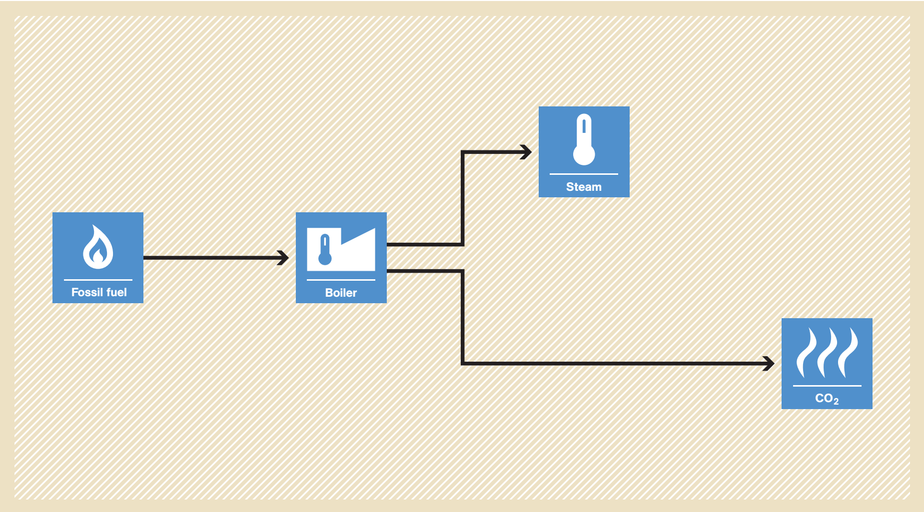
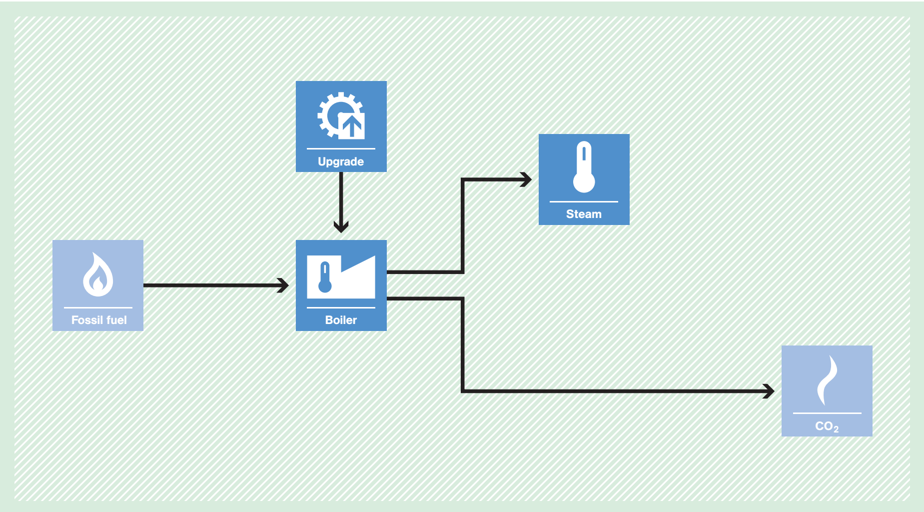
AM0054 Energy efficiency improvement of a boiler by introducing oil/water emulsion technology

Typical project(s)	The project introduces oil/water emulsion technology in an existing residual-fuel-oil-fired boiler for the purpose of improving energy efficiency. Introduction of this technology involves the installation and operation of equipment to mix the residual fuel oil with water and additives prior to combustion in order to improve the efficiency of the combustion process.
Type of GHG emissions mitigation action	• Energy efficiency Switch to more-energy-efficient technology.
Important conditions under which the methodology is applicable	• The boiler has an operating history of at least five years and prior to the implementation of the project, no oil/water emulsion technology was used at the project site; • The project does not result in additional heat demand for pre-heating the oil/water emulsion prior to combustion; • With the implementation of the project, no significant operational, process or equipment modifications are undertaken and the implementation of the project does not result in an increase of heat generation in the boiler.
Important parameters	Monitored: • Heat generated by the boiler, net calorific value and CO_2 emission factor of the residual fuel oil that is fired in the boiler; • Energy efficiency of the boiler without using the oil/water emulsion technology; • Quantity of particulate material that is in the flue gas during the measurement to determine the oxidation factor; • Quantity of the residual fuel oil fired, the ash content, carbon content and density of the residual fuel oil, during the measurement to determine the oxidation factor.
BASELINE SCENARIO Operation of boilers at lower efficiency of combustion in absence of oil/water emulsion technology.	
PROJECT SCENARIO Oil/water emulsion technology is introduced to improve the efficiency of boilers in order to reduce CO_2 emissions.	

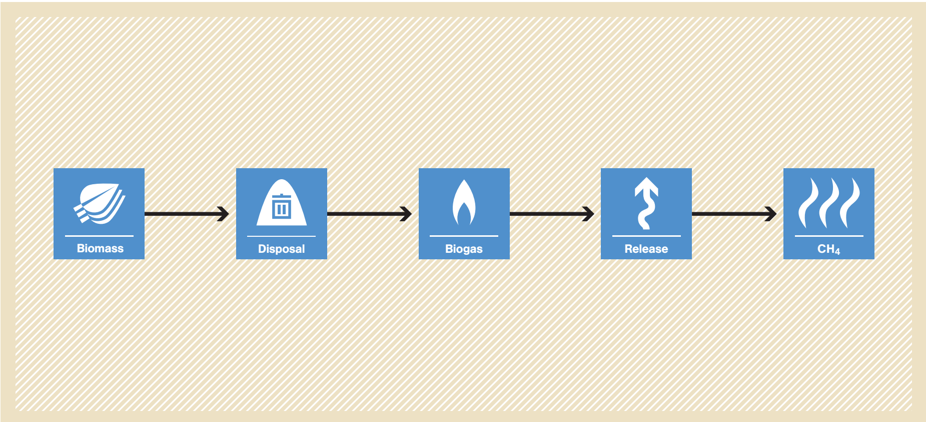
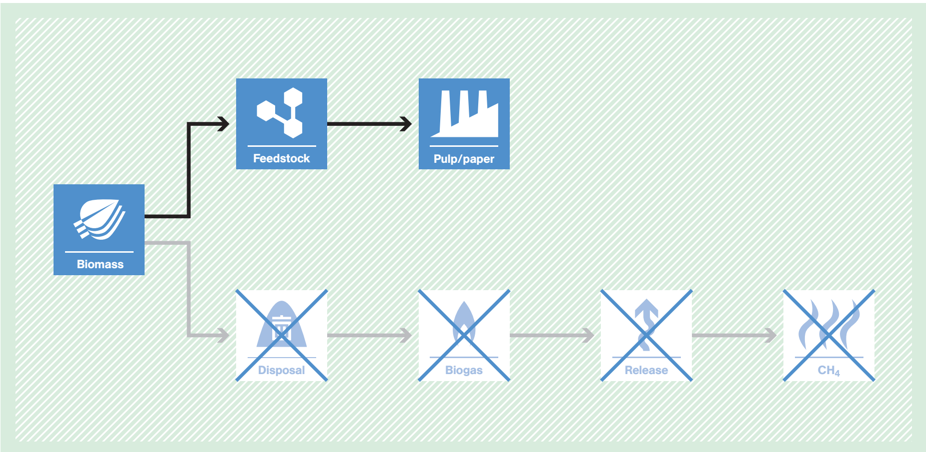
AM0055 Baseline and monitoring methodology for the recovery and utilization of waste gas in refinery facilities

Typical project(s)	The project is implemented in existing refinery facilities to recover waste gas, which is characterized by its low pressure and that is currently being flared to generate process heat in element process(s) (e.g. for the purpose of steam generation by a boiler or hot air generation by a furnace). Recovered waste gas is a by-product generated in several processing units of the refinery. The principal constituents of this gas are methane, ethane, ethylene, normal butane, butylenes, propane, propylene, etc.
Type of GHG emissions mitigation action	• Energy efficiency. Displacement of fossil fuel used for heat production by recovered waste gas.
Important conditions under which the methodology is applicable	• Waste gas volume and composition are measurable and the facility has a minimum of three years records on flaring (not venting) of waste gases, prior to the start of the project, or as long as the processing facility has been in operation; • The waste gas recovery device is placed just before the flare header (with no possibility of diversions of the recovered gas flow) and after all the waste gas generation devices; • The recovered waste gas replaces fossil fuel that is used for generating heat for processes within the same refinery facility.
Important parameters	At validation: • Efficiency of representative element process in baseline scenario where fossil fuel will be replaced by waste gas under the project; • Historical annual average amount of waste gas sent to flares before project implementation.
	Monitored: • Parameters to calculate the emission factor for consumed electricity. • Amount and composition of recovered waste gas (e.g. density, LHV) and data needed to calculate the emission factor of fossil fuel used for process heating and steam generation within the refinery.
BASELINE SCENARIO Use of fossil fuel to generate process heat. Waste gas is flared.	
PROJECT SCENARIO Use of recovered waste gas to generate process heat. Thereby, fossil fuel usage is reduced and waste gas is not flared anymore.	

AM0056 Efficiency improvement by boiler replacement or rehabilitation and optional fuel switch in fossil fuel-fired steam boiler systems

Typical project(s)	Complete replacement of existing boilers by new boilers with a higher efficiency in an existing facility with steam demands or retrofitting of existing boilers in order to increase their efficiency; or a combination with one or both activities described above and a switch in the type of fossil fuel used to fuel boilers.
Type of GHG emissions mitigation action	• Energy efficiency. Technology switch resulting in an increase in energy efficiency.
Important conditions under which the methodology is applicable	• The project boilers utilize fossil fuels to produce steam; • The compliance with national/local regulations are not the cause of the development of the project; • Steam quality (i.e. steam pressure and temperature) is the same prior and after the implementation of the project; • Only one type of fossil fuel is used in all boilers included in the project boundary.
Important parameters	Monitored: • Quantity of fuel used in the boilers; • Quantity of steam produced; • Temperature and pressure of the steam produced.
BASELINE SCENARIO Continuation of the current situation; i.e. use of the existing boilers without fossil fuel switch, replacement of retrofit of the boilers.	
PROJECT SCENARIO Complete replacement of boilers, and/or retrofitting of an existing steam generating system results in higher efficiency and less consumption of fossil fuel (fuel switch may also be an element of the project scenario).	

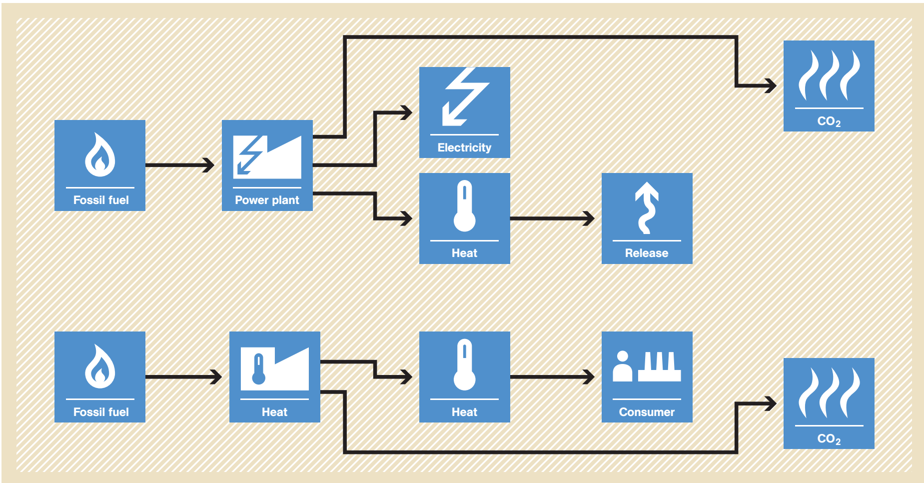
AM0057 Avoided emissions from biomass wastes through use as feed stock in pulp and paper, cardboard, fibreboard or bio-oil production

Typical project(s)	Agricultural wastes are used as feed stock for pulp, paper, cardboard, fibreboard or bio-oil production in a new facility, where the end product is similar in characteristics and quality to existing high quality products in the market and does not require special use or disposal methods.
Type of GHG emissions mitigation action	• GHG emission avoidance. Avoidance of CH_4 emissions.
Important conditions under which the methodology is applicable	• A new production facility is being constructed; • Waste is not stored in conditions that would generate methane; • Production does not involve processes that emit significant additional greenhouse gas emissions except from those arising directly from pyrolysis (bio-oil only) processes that were also used in the baseline or associated with electricity or fossil fuel consumption; • If biomass is combusted for the purpose of providing heat or electricity to the plant, then the biomass fuel is derived from biomass residues; • In the case of bio-oil, the pyrolyzed residues (char) will be further combusted and the energy derived thereof used in the project.
Important parameters	Monitored: • Quantity of waste used as feedstock; • Fossil fuel and electricity consumption; • Transportation parameter – distance, fuel type and load details; • Agricultural waste residues – produced in the region, used in and outside the project and surplus;
BASELINE SCENARIO Agricultural residues are left to decay anaerobically.	
PROJECT SCENARIO Agricultural residues are used as feedstock in a new facility for producing paper, pulp, cardboard, fibreboard or bio-oil.	

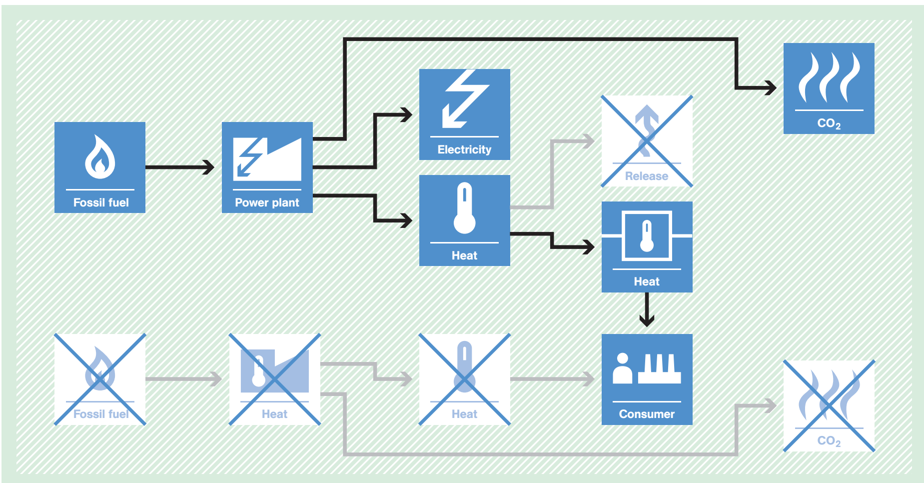
AM0058 Introduction of a new primary district heating system

Typical project(s)	A new primary district heating system supplied by previously unused heat from a fossil-fuel-fired power plant is introduced. It replaces fossil-fuel-fired heat only boilers.
Type of GHG emissions mitigation action	• Energy efficiency. Displacement of fossil-fuel-based heat generation by utilization of waste heat.
Important conditions under which the methodology is applicable	• The heat supplied by the project is predominantly from a grid connected power plant with three years of operation history and no use of waste heat and can be supplemented by new heat-only boilers; • Both power plant and boilers use only one type of fuel; • The heat is used for heating and/or tap water supply in the residential and/or commercial buildings, but not for industrial production processes.
Important parameters	At validation: • Efficiency of the heat supply and fuel types in the baseline; • Minimum and maximum power generation during the last three years.
	Monitored: • Quantity of heat from the cogeneration plant and from all heat only/peak load boilers in the project; • Total area of all the buildings in the project; • Quantity of heat supplied from each sub-station to the buildings; • Quantity of electricity supplied to the grid by the project.

BASELINE SCENARIO
Fossil fuel is used in a power plant that only supplies grid electricity; fossil fuel is used in individual boilers that supply heat to users.



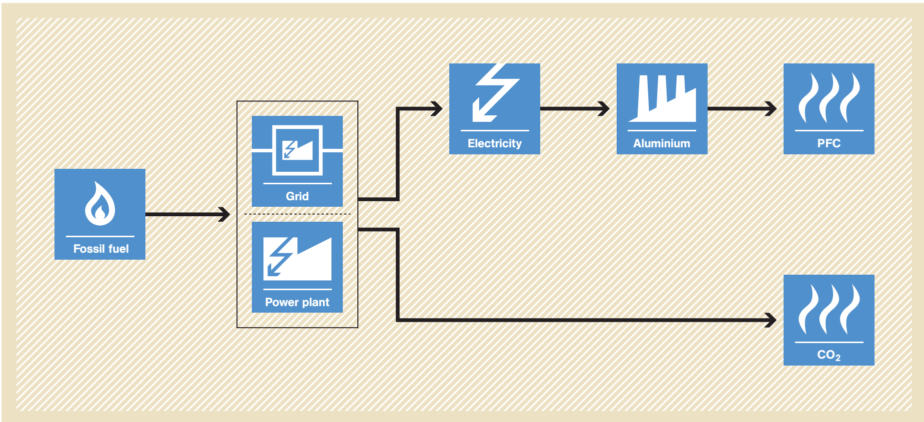
PROJECT SCENARIO
Fossil fuel is used in a power plant that supplies both electricity to the grid and heat to individual users. Fossil fuel previously used in individual boilers is no longer used.



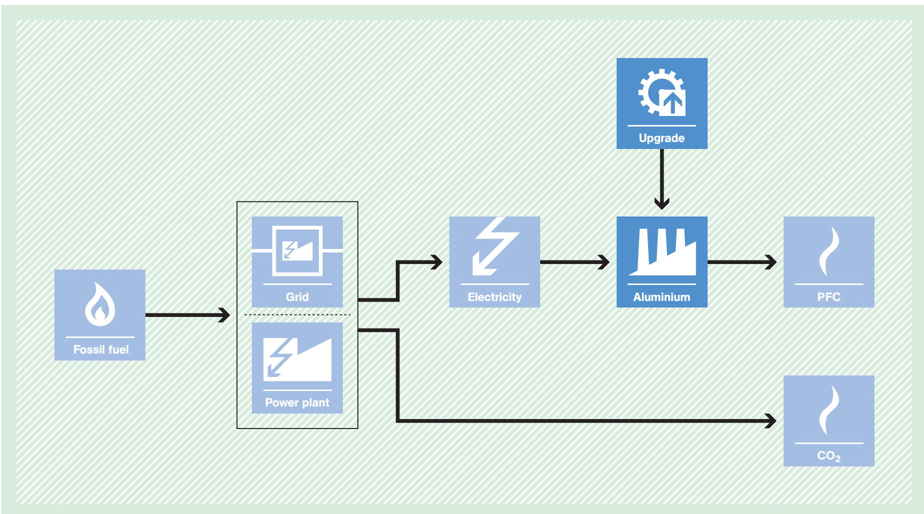
AM0059 Reduction in GHGs emission from primary aluminium smelters

Typical project(s)	Technology improvement at a primary aluminium smelter (PFPB, CWPB, SWPB, VSS or HSS) using computerized controls or improved operating practices, to reduce PFC emissions and/or to improve electrical energy efficiency.
Type of GHG emissions mitigation action	• Energy efficiency; • GHG emission avoidance. Avoidance of PFC emissions and electricity savings leading to less GHG emissions.
Important conditions under which the methodology is applicable	• The project is limited to changes of the smelting technology; • At least three years of historical data for estimating baseline emissions are available.
Important parameters	At validation: • If less than 95% of the anode effects are manually terminated, number and duration of anode effect or anode effect over-voltage, and current efficiency; • PFC emissions. • If applicable: grid emission factor (can also be monitored ex post).
	Monitored: • Quantity of aluminium produced in the project; • Quantity of electricity imported from captive plants and the grid; • PFC emissions; • If applicable: electricity factor for captive generated electricity.

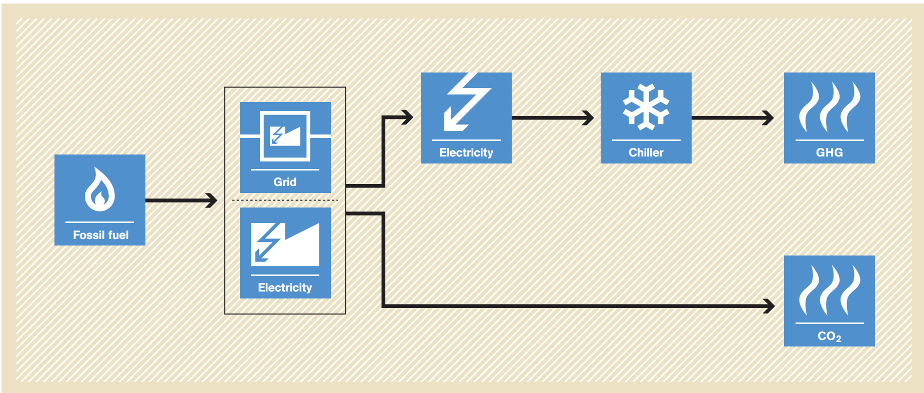
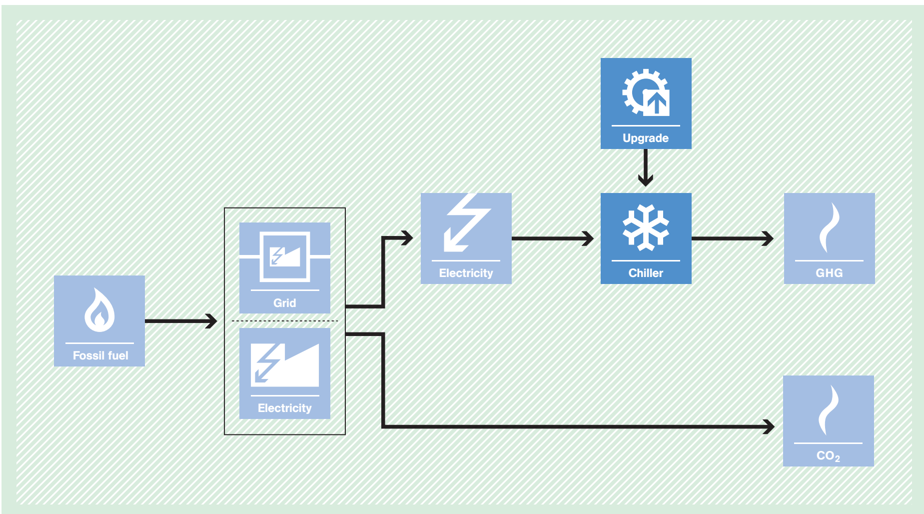
BASELINE SCENARIO
Electricity is consumed to produce aluminium and the production process leads to PFC emissions.



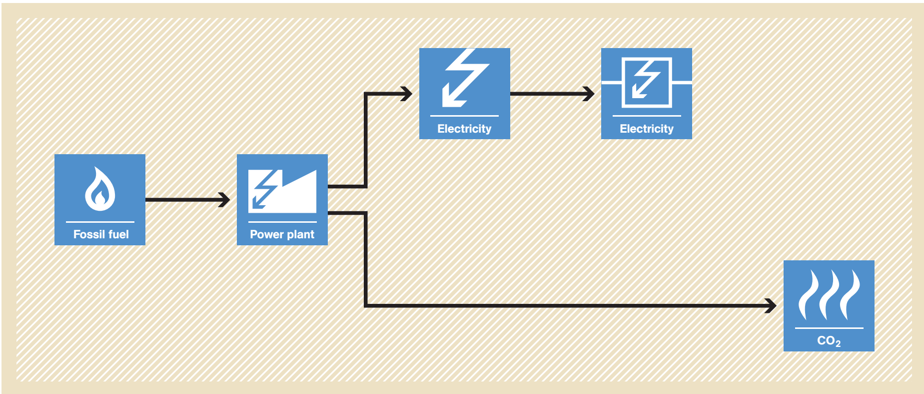
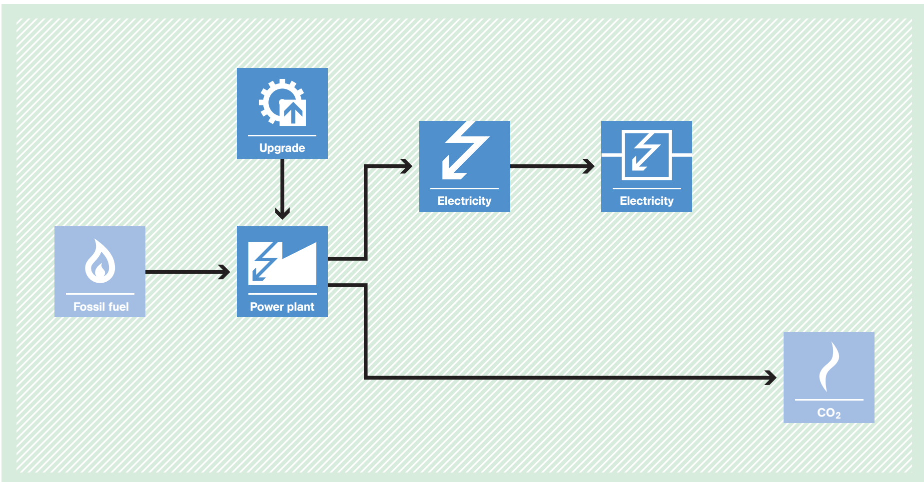
PROJECT SCENARIO
Less electricity is consumed to produce aluminium and the production process leads to less PFC emissions.



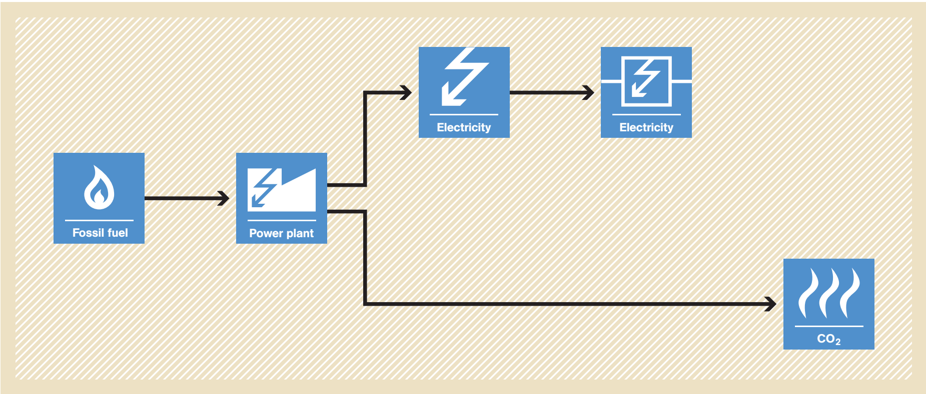
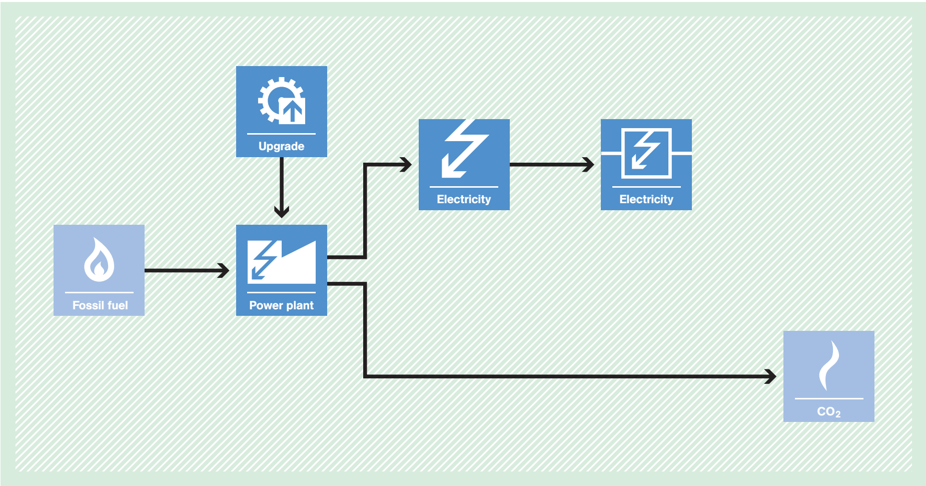
AM0060 Power saving through replacement by energy efficient chillers

Typical project(s)	The one-to-one replacement of existing electricity-driven chillers by more-energy-efficient new chillers with similar rated output capacity to the existing ones.
Type of GHG emissions mitigation action	• Energy efficiency. Electricity savings through energy efficiency improvement.
Important conditions under which the methodology is applicable	• For each chiller replacement, the rated output capacity of the new chiller is not significantly larger or smaller (maximum ±5%) than the existing chiller; • The chiller is used to generate chilled water or a water/antifreeze mixture (e.g. water with addition of glycol) for process cooling or air conditioning; • The existing and new chillers are driven by electrical energy; • The existing chillers are functioning and fully operational and can continue to operate for several years if regular maintenance is undertaken; • The existing chillers are destroyed, and the refrigerant contained in the existing chiller will be recovered and destroyed, or stored in suitable containers.
Important parameters	At validation: • Power consumption function of the existing chillers; • Grid emission factor (can also be monitored ex post). Monitored: • Average chiller output of the new chillers; • Average inlet temperature of condensing water of the new chillers; • Average inlet and outlet temperature of chilled water supplied by the new chillers.
BASELINE SCENARIO Continued operation of the existing, less-energy-efficient chillers.	
PROJECT SCENARIO Operation of energy-efficient chillers, resulting into lower CO_2 emissions.	

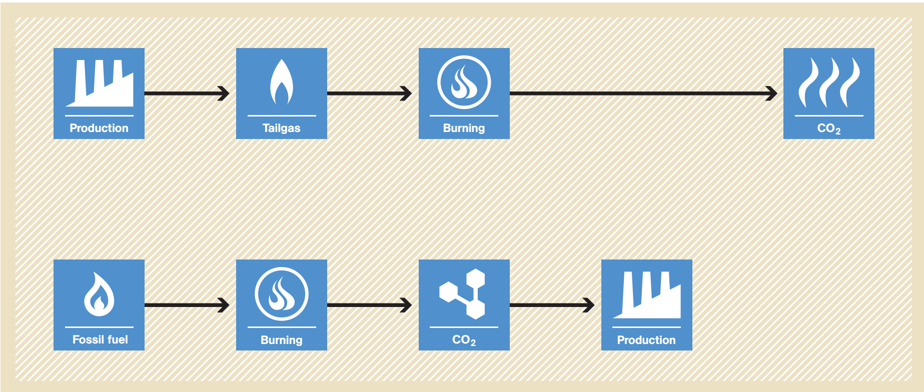
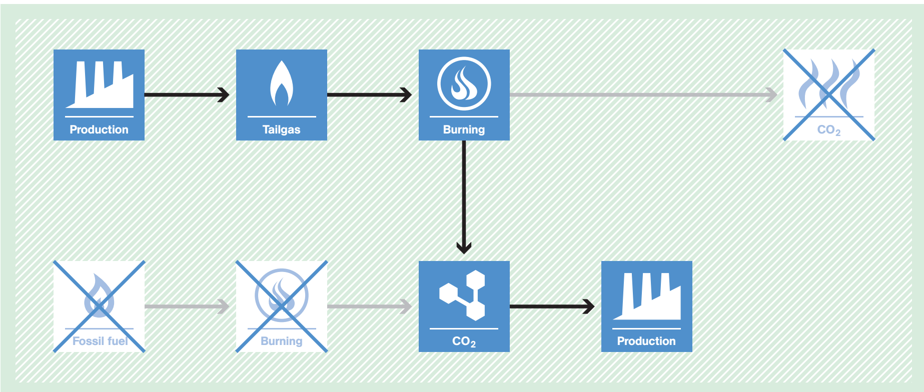
AM0061 Methodology for rehabilitation and/or energy efficiency improvement in existing power plants

Typical project(s)	Implementation of measures to increase the energy efficiency of existing power plants that supply electricity to the grid. Examples of these measures are: the replacement of worn blades of a turbine by new ones; the implementation of new control systems; replacement of deficient heat exchangers in a boiler by new ones, or the installation of additional heat recovery units in an existing boiler.
Type of GHG emissions mitigation action	• Energy efficiency. Technology switch resulting in an increase in energy efficiency in an existing power plant.
Important conditions under which the methodology is applicable	• The project does not involve the installation and commissioning of new electricity generation units; • The designed power generation capacity of each unit may increase as a result of the project but this increase is limited to 15% of the former design power generation capacity of the whole plant; • The existing power plant has an operation history of at least 10 years and data on fuel consumption and electricity generation for the most recent five years prior to the implementation of the project are available; • Only measures that require capital investment can be included. Consequently, regular maintenance and housekeeping measures cannot be included in the project.
Important parameters	Monitored: • Energy efficiency of the project power plant; • Quantity of fuel used in the project power plant; • Calorific value and emission factor of the fuel used in the project power plant; • Electricity supplied to the grid by the project power plant.
BASELINE SCENARIO Continuation of the operation of the power plant, using all power generation equipment already used prior to the implementation of the project, and undertaking business as usual maintenance.	
PROJECT SCENARIO Implementation of energy efficiency improvement measures or the rehabilitation of an existing fossil-fuel-fired power plant. As a result, less fossil fuel is consumed to generate electricity.	

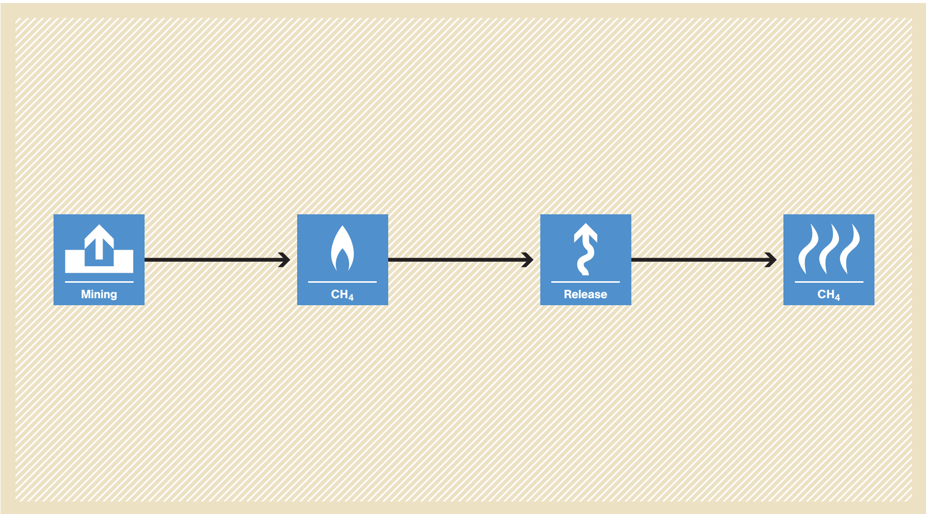
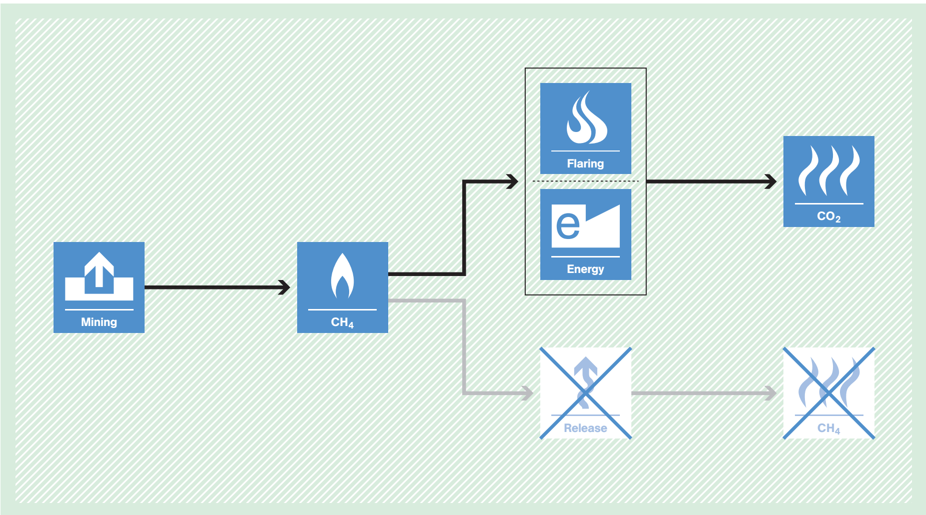
AM0062 Energy efficiency improvements of a power plant through retrofitting turbines

Typical project(s)	Implementation of measures to increase the energy efficiency of steam or gas turbines in existing power plants that supply electricity to the grid. Examples of these measures are: replacement of worn blades of a turbine by new ones; implementation of refined sealing to reduce leakage; replacement of complete inner blocks (steam path, rotor, inner casing, inlet nozzles).
Type of GHG emissions mitigation action	• Energy efficiency. Technology switch resulting in an increase in energy efficiency at an existing power plant.
Important conditions under which the methodology is applicable	• The project power plant utilizes fossil fuel to operate. • Measures related to recommended regular or preventive maintenance activities (including replacements and overhauling) as provided by the manufacturer of turbine, or superior practices of preventive maintenance (e.g. sophisticated cleaning systems resulting in improved efficiency) are not applicable; • The operational parameters that affect the energy efficiency of the turbine (e.g. steam pressure and temperature, quality of steam in the case of a saturated steam turbine; condenser vacuum, and combustion temperature for gas turbine) remain the same, subject to a variation of +/-5%, in the baseline and the project scenario; • The methodology is applicable up to the end of the lifetime of the existing turbine, if shorter than the crediting period.
Important parameters	Monitored: • Quantity, calorific value and emission factor of fuel used in the project power plant; • Electricity supplied to the grid by the project power plant; • Enthalpy of the steam supplied to the turbine, in case of steam turbines.
BASELINE SCENARIO Continuation of the current practice; i.e. the turbine continues to be operated without retrofitting.	
PROJECT SCENARIO Retrofitting of steam turbines and gas turbines with components of improved design to increase the energy efficiency in an existing fossil fuel power plant. Thus, fossil fuel consumption is reduced.	

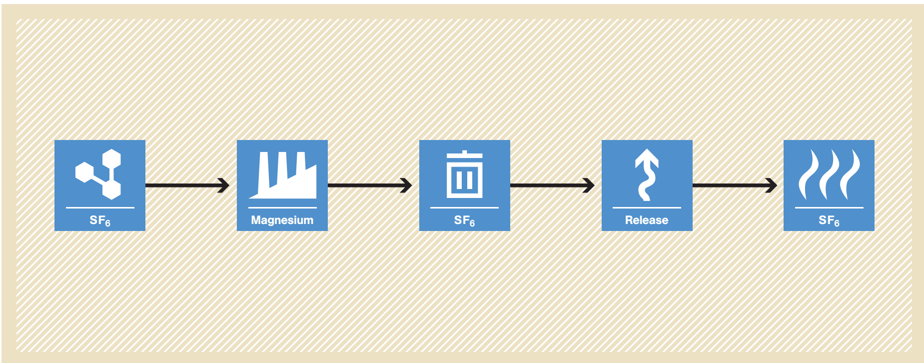
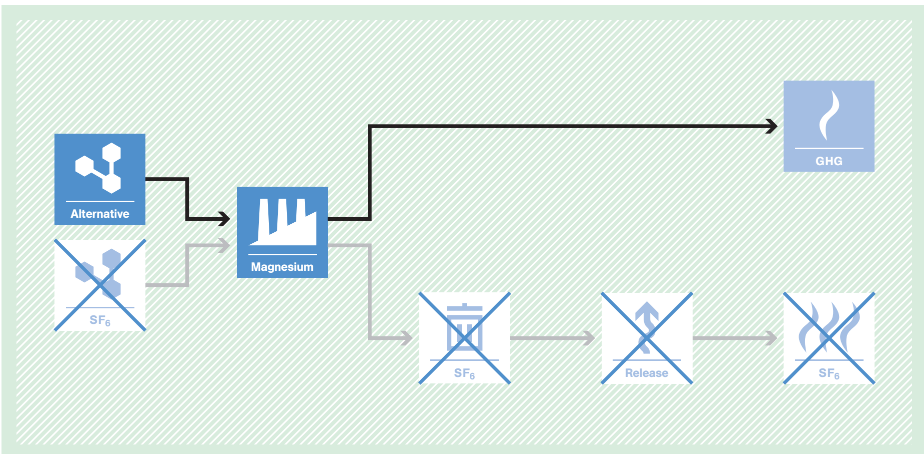
AM0063 Recovery of CO_2 from tail gas in industrial facilities to substitute the use of fossil fuels for production of CO_2

Typical project(s)	Recovery of CO_2 from the tail gas generated by an existing industrial facility to substitute the combustion of fossil fuels at an existing conventional CO_2 production facility or a new CO_2 production plant.
Type of GHG emissions mitigation action	• Feedstock switch. Displacement of more-GHG-intensive feedstock with CO_2 recovered from the tail gas.
Important conditions under which the methodology is applicable	• The tail gas from the existing industrial facility has been produced for as long as the industrial facility has been in operation; • There exist at least three years of historical records related to the operation of the industrial facility from which the tail gas is extracted; • Prior to the project implementation, the tail gas has either been used as fuel in the industrial facility without extraction of the CO_2 or has been flared; • The total amount of CO_2 produced at the project facility shall not be consumed at the project facility (e.g. for manufacturing of chemicals) and has to be sold within the host country.
Important parameters	At validation: • Quantity of CO_2 produced at the existing CO_2 production facility; • Electricity and fuel consumption at the existing CO_2 production facility.
	Monitored: • Average carbon content and volume of the tail gas delivered to the project CO_2 production facility; • Quantity of CO_2 produced at the project CO_2 production facility; • Average carbon content and volume of the off gas combusted at the industrial facility; • Amount and end use of CO_2 purchased by customers and date of delivery.
BASELINE SCENARIO Combustion of fossil fuel at a conventional CO_2 production facility.	
PROJECT SCENARIO Recovery of CO_2 from the tail gas generated by an existing industrial facility for use at the project CO_2 production facility.	

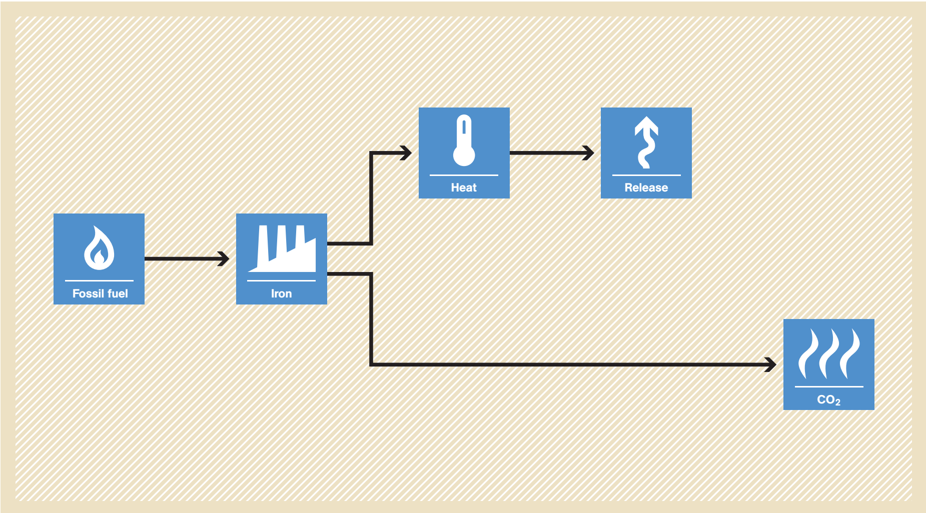
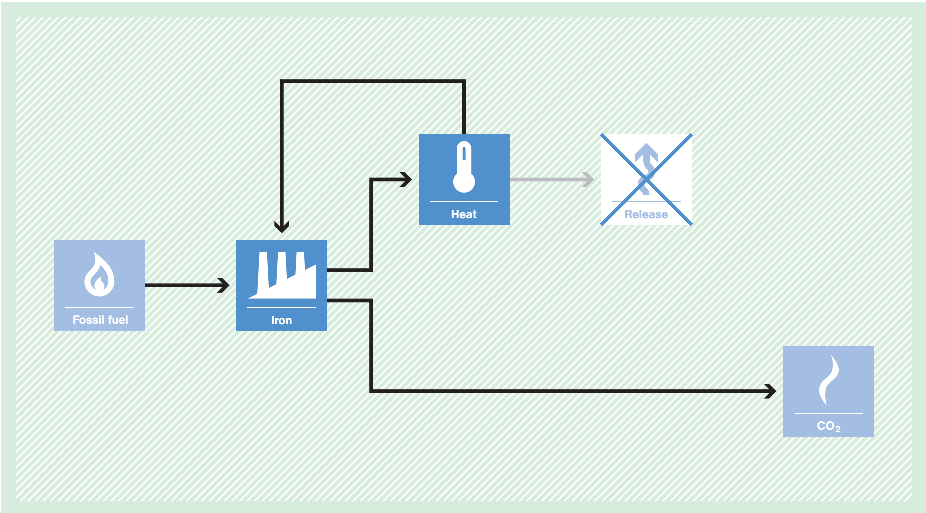
AM0064 Methodology for methane capture and utilisation or destruction in underground, hard rock, precious and base metal mines

Typical project(s)	Capture and utilization or destruction of methane from an operating mine, excluding mines where coal is extracted; capture and destruction of methane released from geological structures, e.g. methane released directly from holes drilled in geological formations specifically for mineral exploration and prospecting activities.
Type of GHG emissions mitigation action	• GHG destruction. Avoidance of GHG emissions from underground, hard rock, precious and base metal mines.
Important conditions under which the methodology is applicable	• In case the project is capture and utilization or destruction of methane from a operating mine, the captured methane is utilized to produce electricity, motive power and/or thermal energy and/or destroyed through flaring. Prior to the start of the project all methane was released into the atmosphere or partially used for heat generation. • In case the project is capture and destruction of methane released from geological structures, abandoned or decommissioned mines, as well as open cast mines are excluded. Coal extraction mines or oil shale, as well as boreholes or wells opened for gas/oil exploration or extraction do not qualify.
Important parameters	Monitored: • Concentration of methane in extracted gas; • Quantity of methane sent to power plant, boiler and gas grid for end users; • Quantity of electricity and heat generated by the project.
BASELINE SCENARIO Methane is emitted from operating mines and geological structures into the atmosphere.	
PROJECT SCENARIO Methane is captured and destroyed or utilized for energy generation.	

AM0065 Replacement of SF_6 with alternate cover gas in the magnesium industry

Typical project(s)	Full or partial replacement of the use of cover gas SF_6, an inert gas used to avoid oxidation of molten magnesium in casting and alloying processes, by alternate cover gas (HFC134a, Perfluoro-2-methyl-3-pentanone ($CF_3CF_2C(O)CF(CF_3)_2$) or SO_2 using lean SO_2 technology), in existing facilities of magnesium metal cast industry.
Type of GHG emissions mitigation action	• GHG emission avoidance. Avoidance of SF_6 emissions by the use of alternate cover gas.
Important conditions under which the methodology is applicable	• Project of SF_6 replacement can be implemented in all segments of the magnesium metal cast industry, as defined in the methodology; • The magnesium metal cast facility has an operating history of at least three years prior to the project implementation; • If SO_2 is used as cover gas in the project, only "dilute SO_2" technology is used that meets the specifications provided in methodology; • Local regulations in the host country regarding SO_2 emissions in the exhausting system should be complied with. If such regulations are not in place, the values of SO_2 emissions given in the methodology should be complied with.
Important parameters	At validation: • Amount of magnesium manufactured in the most recent three years; • SF_6 consumption in the magnesium cast facility in the most recent three years prior to the project implementation.
	Monitored: • Amount of magnesium manufactured in the project; • Consumption of alternate cover gas in the project; • Consumption of SF6 or CO_2 in the project, if any.
BASELINE SCENARIO SF_6 continues to be used as cover gas in magnesium metal cast industry, leading to its emission from the processes.	
PROJECT SCENARIO SF_6 is replaced with alternate cover gas, resulting in avoidance of SF_6 emissions.	

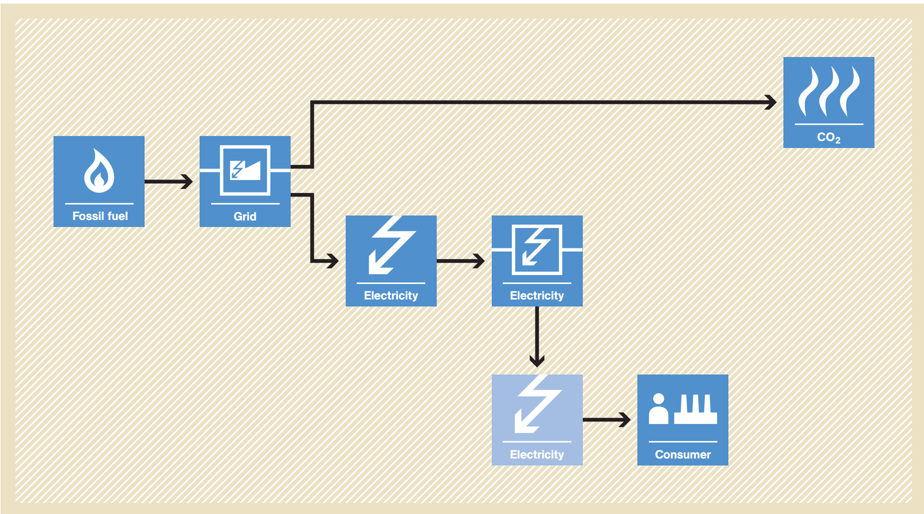
AM0066 GHG emission reductions through waste heat utilisation for pre-heating of raw materials in sponge iron manufacturing process

Typical project(s)	Waste heat released from furnace(s)/kiln(s) is utilized to preheat raw material(s) in an existing or greenfield sponge iron manufacturing facility.
Type of GHG emissions mitigation action	• Energy efficiency. Energy efficiency improvement leading to reduced specific heat consumption.
Important conditions under which the methodology is applicable	• The project is implemented either for an individual furnace/kiln or a group of furnaces/kilns producing the same type of output; • Waste heat to be utilized is generated in the project furnace(s)/kiln(s); • Only solid matter without scrap/product rejects is used as raw material; • In the project, the raw material is fed directly from the preheater to the furnace/kiln. However, the possibility to bypass the preheater equipment remains.
Important parameters	At validation: • Historical production and fossil fuel consumption.
	Monitored: • Quantity, chemical composition and physical state (including the percentage of the metallization) of raw materials and final product; • Type and quantities of fossil fuel; • Quantity of thermal and electrical (from the grid and from the captive power plant, respectively) energy consumed.
BASELINE SCENARIO Fossil fuel is fired for the process. The resulting heat from furnace(s)/kiln(s) is not utilized and instead vented.	
PROJECT SCENARIO Less fossil fuel is fired in the process. The heat from furnace(s)/kiln(s) is used to preheat raw material(s) before feeding it into the furnace(s)/kiln(s).	

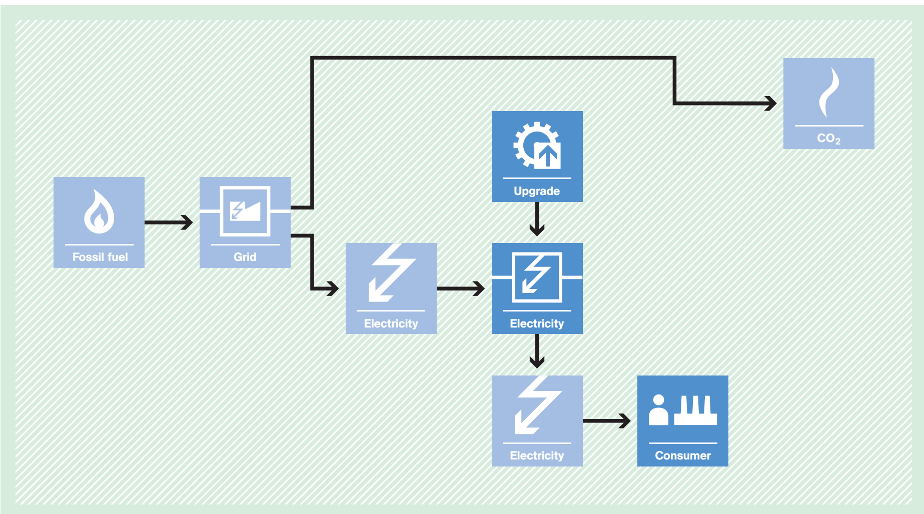
AM0067 Methodology for installation of energy efficient transformers in a power distribution grid

Typical project(s)	Replacement of existing less-efficient transformers with more-efficient transformers in an existing distribution grid or the installation of new high-efficient transformers in new areas that are currently not connected to a distribution grid.
Type of GHG emissions mitigation action	• Energy efficiency. Implementation of high-efficient transformers reduces losses in the grid and thereby GHG emissions.
Important conditions under which the methodology is applicable	• Emission reductions due to reduction in no-load losses alone are claimed; • Load losses, at rated load, of the transformers implemented under the project are demonstrated to be equal or lower than the load losses in transformers that would have been installed in absence of the project; • Project proponent implements a scrapping system to ensure that the replaced transformers are not used in other parts of the distribution grid or in another distribution grid.
Important parameters	At validation: • Average of no-load loss rate provided by the manufacturers of all type of transformers; • Grid emission factor (can also be monitored ex post).
	Monitored: • Cumulative number of transformers installed by the project as well as related load-loss rates and the black out rate.

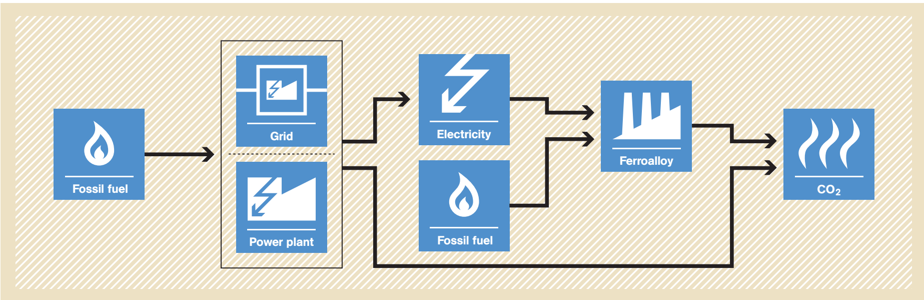
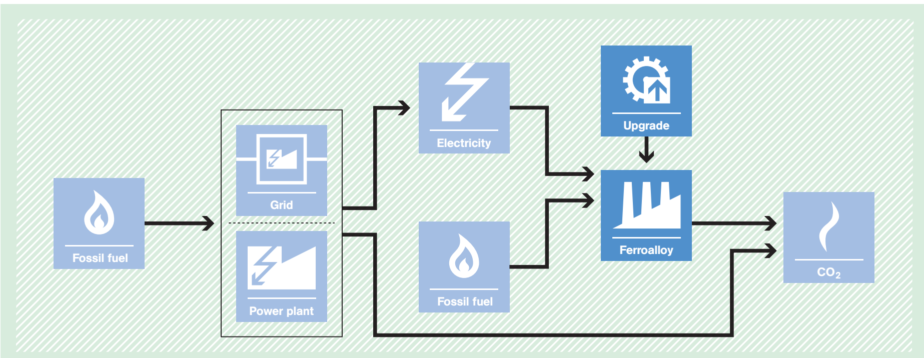
BASELINE SCENARIO
Less-efficient transformers are installed in existing distribution grids or will be installed in new distribution grids.



PROJECT SCENARIO
High-efficient transformers are installed in existing distribution grids or will be installed in new distribution grids resulting in lower electricity generation requirements and thereby a reduction of GHG emissions.



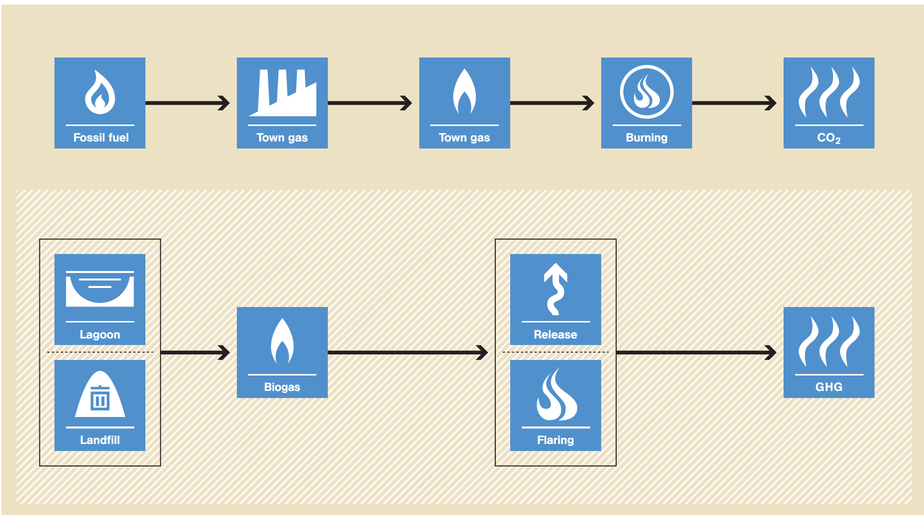
AM0068 Methodology for improved energy efficiency by modifying ferroalloy production facility

Typical project(s)	The project is implemented to improve energy efficiency of an existing ferroalloy production facility. Improvement includes modification of existing submerged electric arc smelting furnace(s) into open slag bath smelting furnace(s) or modification of existing co-current rotary kilns into counter-current rotary kilns. The existing facility is limited to the submerged electric arc smelting furnace(s) and rotary kilns producing only one type of ferroalloy, as defined by the composition of its ingredients.
Type of GHG emissions mitigation action	• Energy efficiency. Switch to more-efficient technology.
Important conditions under which the methodology is applicable	• The project includes at least the modification of "submerged bath electric furnaces" to "open slag bath melting furnaces" and can also include a modification of "co-current rotary kilns" to "counter-current rotary kilns". • Only one type of ferroalloy is produced at the facility and its type and quality is not affected by the project and remains unchanged throughout the crediting period; • Data for at least the three years preceding the implementation of the project is available to estimate the baseline emissions.
Important parameters	At validation: • Quantity and quality of ferroalloys produced; • Consumption of electricity and fossil fuels in rotary kilns and smelting furnaces; • Grid emission factor (can also be monitored ex post).
	Monitored: • Quantity and quality of ferroalloy produced; • Consumption of electricity and fossil fuels in rotary kilns and smelting furnaces; • Non energy-related carbon streams (quantities and carbon content of reducing agents and its volatiles, ore, slag forming material, non product stream, etc.).
BASELINE SCENARIO Energy (fossil fuel and electricity) is used in a ferroalloy production facility, leading to CO_2 emissions.	
PROJECT SCENARIO Less energy (fossil fuel and electricity) is used in a ferroalloy production process, leading to lower CO_2 emissions.	

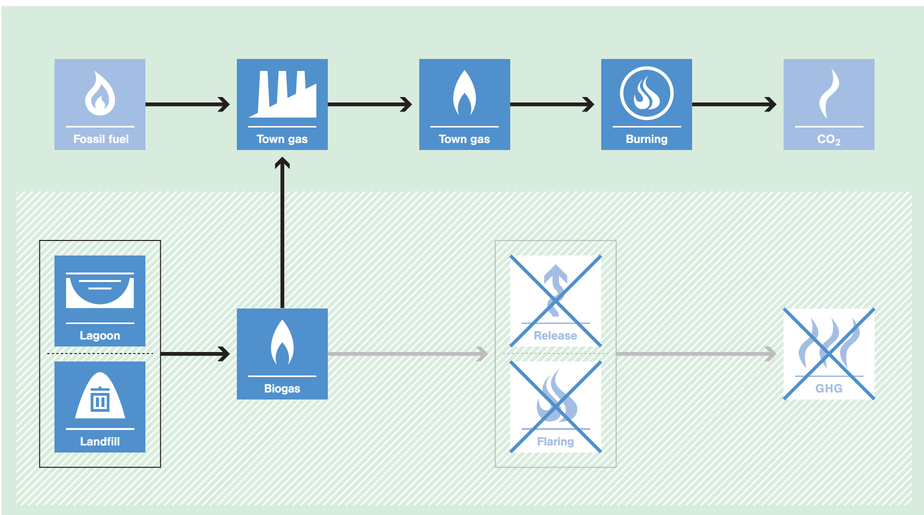
AM0069 Biogenic methane use as feedstock and fuel for town gas production

Typical project(s)	Capture of biogas at a wastewater treatment facility or a landfill and use of the biogas to fully or partially substitute natural gas or other fossil fuels as feedstock and fuel for the production of town gas.
Type of GHG emissions mitigation action	• GHG destruction; • Renewable energy; • Feedstock switch. CH_4 emissions are avoided and fossil fuel is replaced.
Important conditions under which the methodology is applicable	• There is no change in the quality of the produced town gas; • Town gas consumer and/ or distribution grid are within the host country boundaries; • Biogas is captured at an existing landfill site or wastewater treatment facility that has at least a three-year record of venting or flaring of biogas. Biogas would continue to be vented or flared in the absence of the project; • Project is implemented in an existing town gas factory that used only fossil fuels, no biogas, for at least three years prior to the start of the project.
Important parameters	Monitored: • Quantity and calorific value of town gas produced. • Quantity and calorific value of the biogas and fossil fuel used as feedstock.

BASELINE SCENARIO
Venting or flaring of biogas at the site where it is captured and use of fossil fuel as feedstock for town gas production.



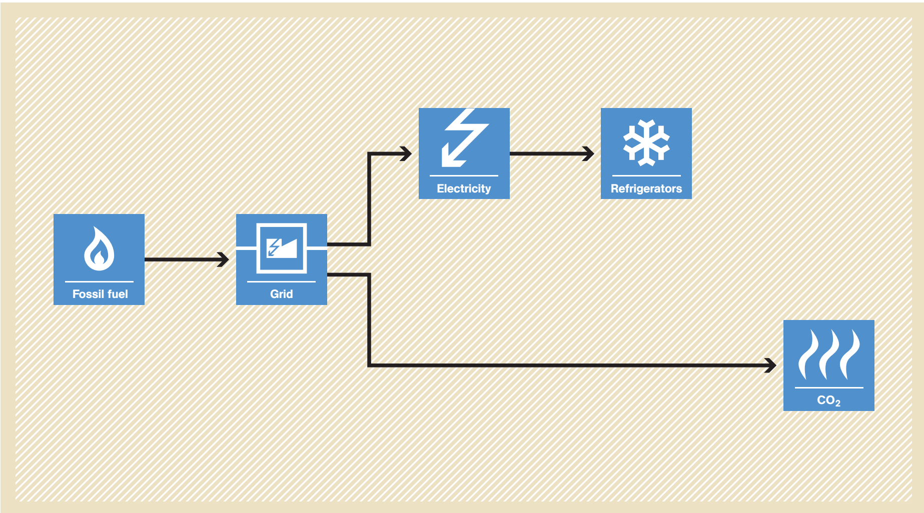
PROJECT SCENARIO
Capture of biogas from landfills and/or waste treatment plants and use of it to replace fossil fuel.



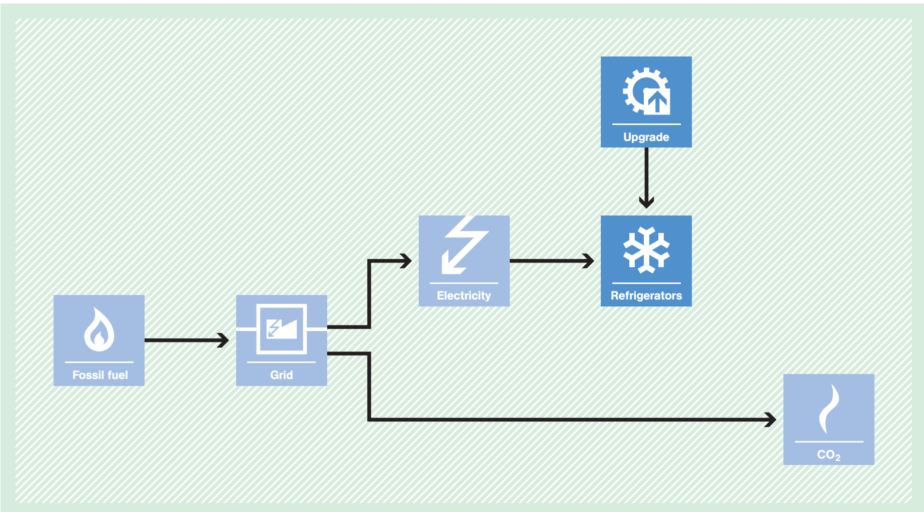
AM0070 Manufacturing of energy efficient domestic refrigerators

Typical project(s)	Increase in the energy efficiency of manufactured refrigerators.
Type of GHG emissions mitigation action	• Energy efficiency. Increase in energy efficiency to reduce electricity consumed per unit of service provided.
Important conditions under which the methodology is applicable	• Refrigerators are used by households on a continuous basis; • No increase in the GWP of refrigerants and foam blowing agents used; • No change in the general type of refrigerators.
Important parameters	At validation: • Autonomous improvement ratio; • Information on historical sales (quantity, storage volumes, rated electricity consumption); • Grid emission factor (can also be monitored ex post). Monitored: • Quantity of refrigerators sold; • Specifications (model, design type and volume class) of refrigerators sold. • Electricity consumption of refrigerators in the monitoring sample group.

BASELINE SCENARIO
High electricity consumption by inefficient domestic refrigerators results in high CO_2 emissions from generation of electricity.



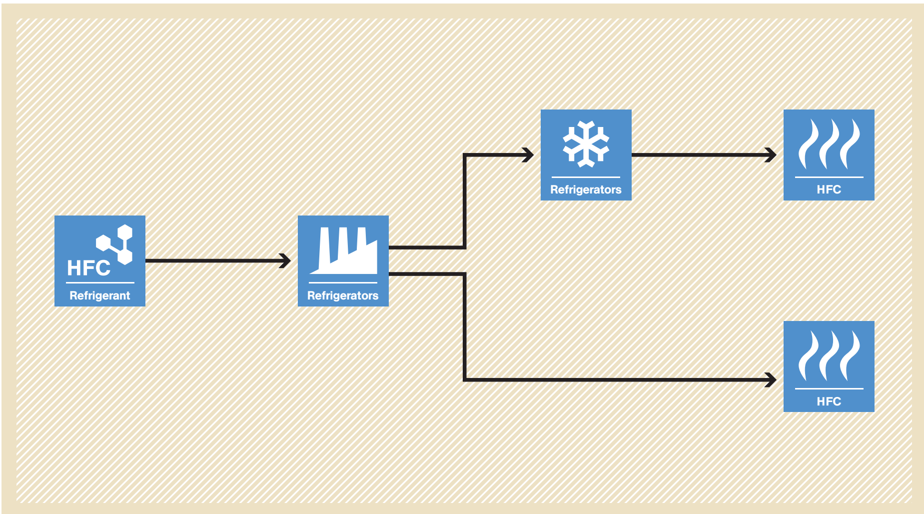
PROJECT SCENARIO
Lower electricity consumption by more-efficient domestic refrigerators results in less CO_2 emissions from generation of electricity.



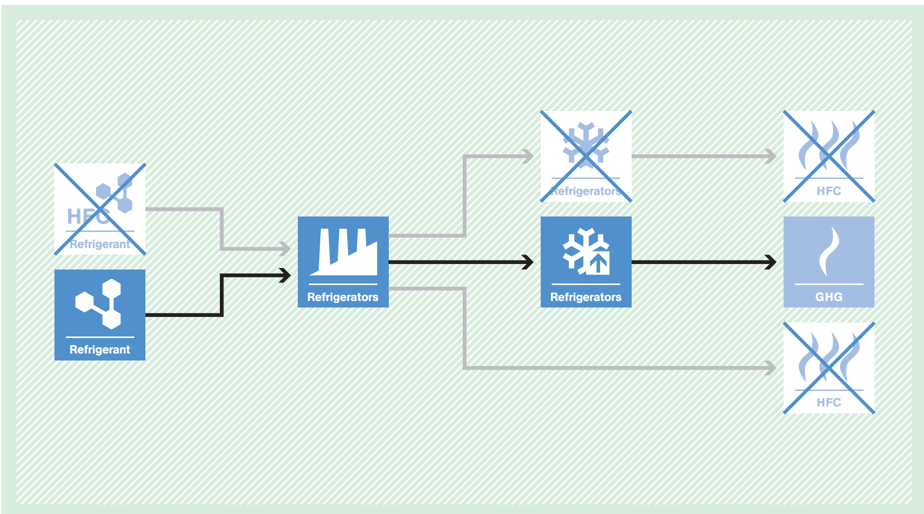
AM0071 Manufacturing and servicing of domestic and/or small commercial refrigeration appliances using a low GWP refrigerant

Typical project(s)	Switching from a high GWP to low GWP refrigerant while manufacturing and refilling domestic and/or small commercial refrigeration appliances.
Type of GHG emissions mitigation action	• Feedstock switch. Avoidance of GHG emission by switching from high-GWP refrigerant to low-GWP refrigerant.
Important conditions under which the methodology is applicable	• The manufacturer has been producing refrigeration appliances using HFC-134a for at least three years and has not been using low-GWP refrigerants prior to the start of the project; • Only one low-GWP refrigerant is used in manufacturing and refilling of refrigeration appliances; • The project does not lead to a decrease in energy efficiency; • Imported refrigeration appliances shall not be included in the project; • Less than 50% of the domestic refrigerant production use low GWP refrigerants.
Important parameters	At validation: • Historical production of refrigerators sold in host country with initial charge.
	Monitored: • Initial refrigerant charge in the project and its distribution losses; • Quantities and models of appliances manufactured and exported; • Number of reject units of refrigeration appliance model; • Failure rate involving refrigerant recharge.

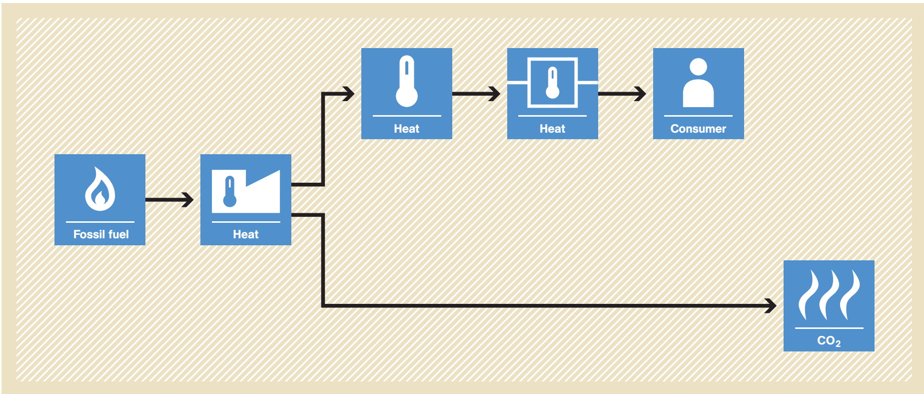
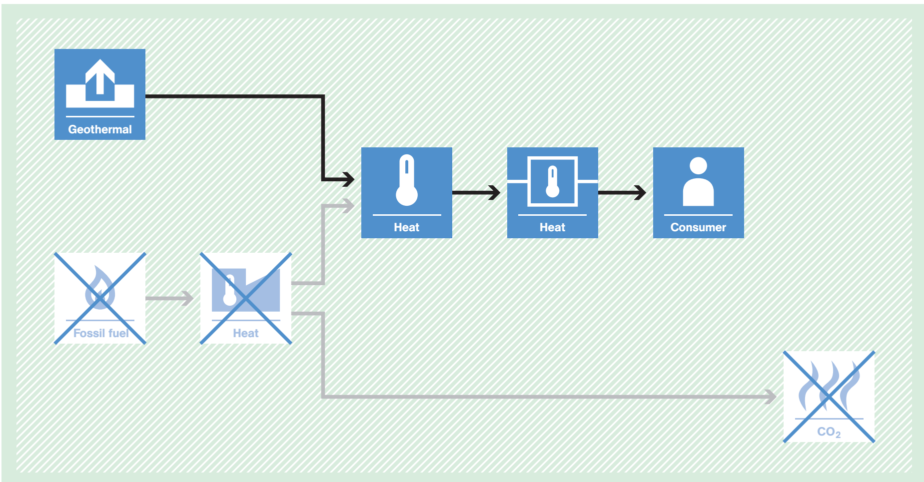
BASELINE SCENARIO
Production of refrigeration appliances with high-GWP refrigerant.



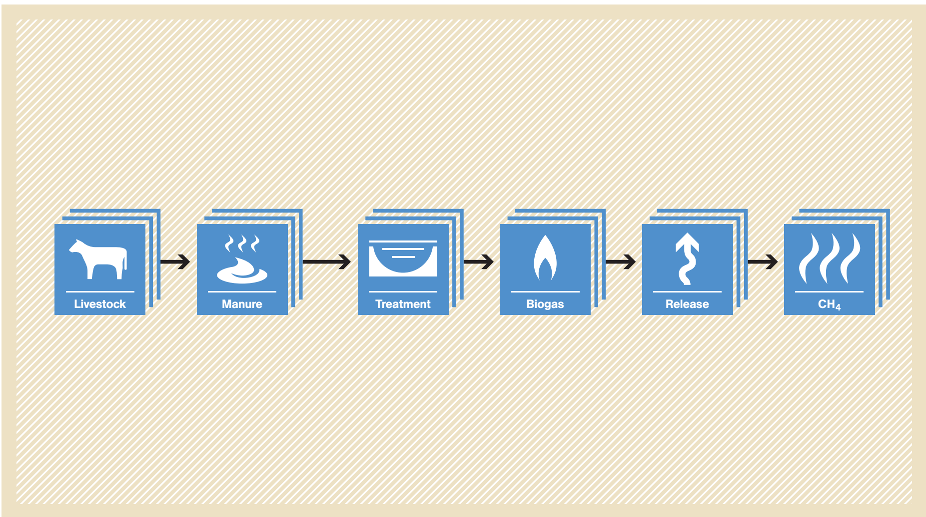
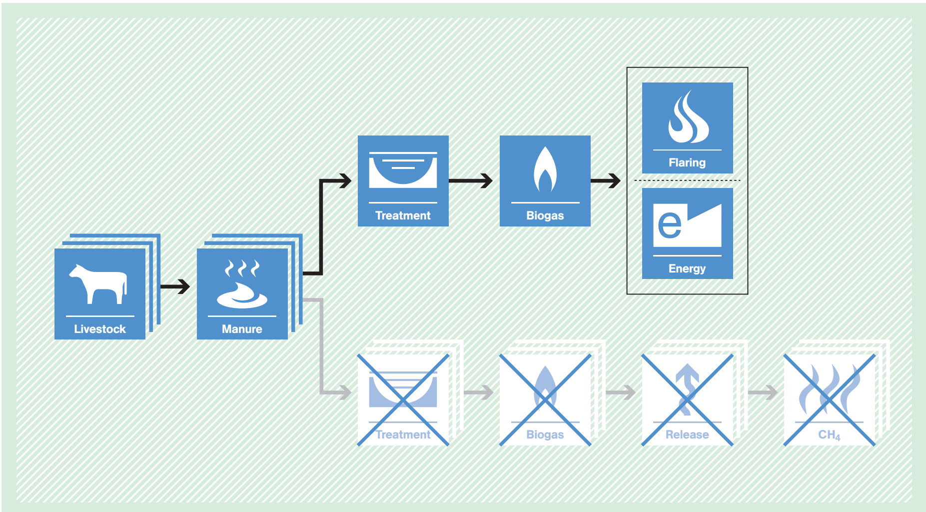
PROJECT SCENARIO
Production of refrigeration appliances with low-GWP refrigerant.



AM0072 Fossil fuel displacement by geothermal resources for space heating

Typical project(s)	Introduction of a centralized geothermal heat supply system for space heating in buildings. The geothermal heat supply system can be a new system in new buildings, the replacement of existing fossil fuel systems or the addition of extra geothermal wells to an existing system.
Type of GHG emissions mitigation action	• Renewable energy. Displacement of more-GHG-intensive thermal energy generation.
Important conditions under which the methodology is applicable	• Use geothermal resources for centralized space-heating system in residential, commercial and/or industrial areas; • Use of GHG-emitting refrigerants is not permitted; • The heat drawn from the geothermal water replaces, partially or completely, the use of fossil fuel in the baseline situation whereas a maximum increase of the previous capacity of 10% is eligible (otherwise a new baseline scenario has to be developed).
Important parameters	At validation: • If applicable: three years of historical data for fossil fuel system, e.g. average thermal energy output or fuel consumption.
	Monitored: • Temperature difference between inlet and outlet temperatures as well as flow rate at the downstream of the geothermal heat exchanger and the net heating area of the buildings included in the project boundary; • Geothermal non-condensable gas (CO_2 and CH_4) produced after the implementation of the project.
BASELINE SCENARIO Fossil fuel is used as energy source for space heating	
PROJECT SCENARIO Installation of a new geothermal system in new building(s), replacement of existing fossil fuel heating systems or expansion of capacity of an existing geothermal system instead of using fossil fuel.	

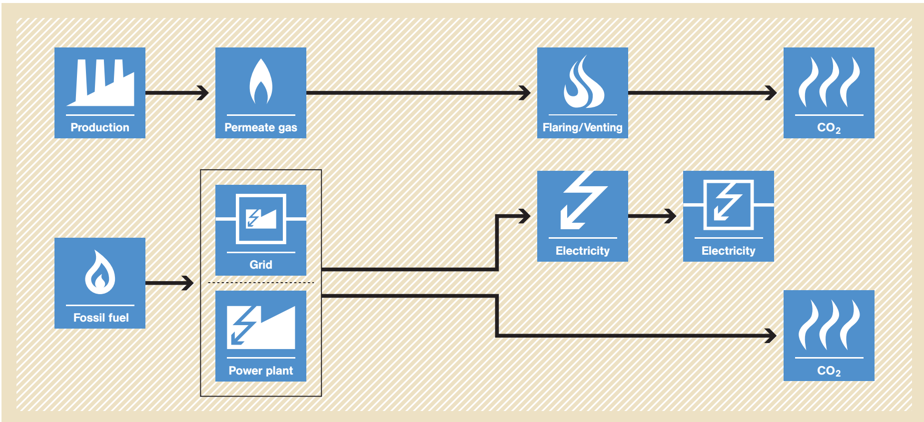
AM0073 GHG emission reductions through multi-site manure collection and treatment in a central plant

Typical project(s)	Manure is collected by tank trucks, canalized and/or pumped from multiple livestock farms and then treated in a single central treatment plant.
Type of GHG emissions mitigation action	• GHG destruction. Release of CH_4 emissions is avoided by combustion of methane.
Important conditions under which the methodology is applicable	• Livestock farm populations are managed under confined conditions; • Manure is not discharged into natural water resources (e.g. rivers or estuaries); • Animal residues are treated under anaerobic conditions in the baseline situation (conditions for this treatment process are specified); • If treated residue is used as fertilizer in the baseline, then this end use continues under the project; • Sludge produced during the project is stabilized through thermal drying or composting, prior to its final disposition/application.
Important parameters	Monitored: • Volume, volatile solids and total nitrogen of the effluent and residues being treated or produced at the central treatment plant; • Auxiliary energy used to run project treatment steps; • Electricity or heat generated by the use of biogas.
BASELINE SCENARIO Anaerobic manure treatment systems without methane recovery result in CH_4 emissions.	
PROJECT SCENARIO Manure from farms is collected and processes in a central treatment plant. Methane is captured and flared or used. In case of energetic use of biogas, displacement of more-GHG-intensive energy generation.	

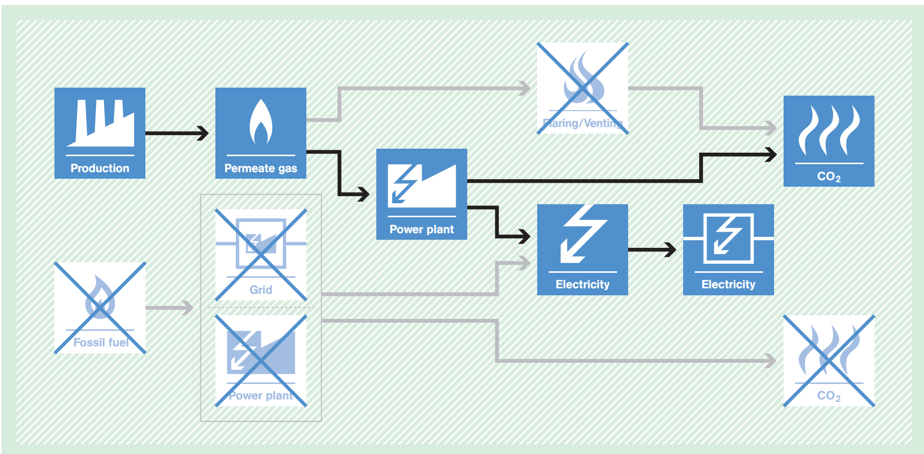
AM0074 Methodology for new grid connected power plants using permeate gas previously flared and/or vented

Typical project(s)	Construction and operation of a power plant that supplies electricity to the grid and uses permeate gas, low heating value off-gas resultant from the processing of natural gas, as fuel to operate the power plant.
Type of GHG emissions mitigation action	• Low carbon electricity. Displacement of electricity that would be provided by more-carbon-intensive means.
Important conditions under which the methodology is applicable	• The total amount of permeate gas from the gas processing facility was flared and/or vented for at least three years prior to the start of the project; • The transportation of the permeate gas from the natural gas processing facility to the new power plant occurs through a dedicated pipeline that is established as part of the project and not used for the transportation of any other gases; • All power produced by the project power plant is exported to the grid.
Important parameters	At validation: • Fugitive CH_4 emission factor of all relevant equipment types used to transport the permeate gas.
	Monitored: • Electricity supplied to the grid by the project power plant; • Average mass fraction of methane in the permeate gas; • Operation time of equipment used to transport the permeate gas; • Emission factor of baseline electricity generation, derived from an emission factor of the grid, or the power generation technology that would most likely be used in the absence of the project.

BASELINE SCENARIO
Permeate gas is flared and/or vented. Electricity is generated using processed natural gas or other energy sources than permeate gas, or electricity is provided by the grid.



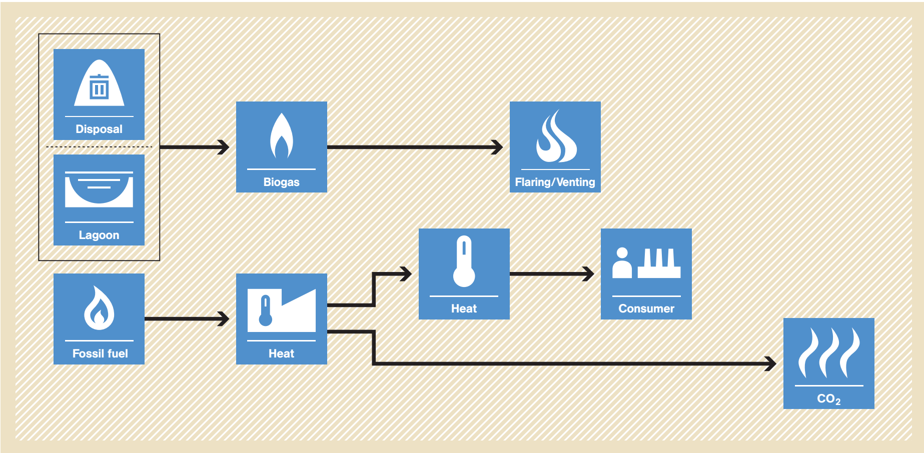
PROJECT SCENARIO
Permeate gas, previously flared and/or vented at the existing natural gas processing facility, is used as fuel in a new grid-connected power plant.



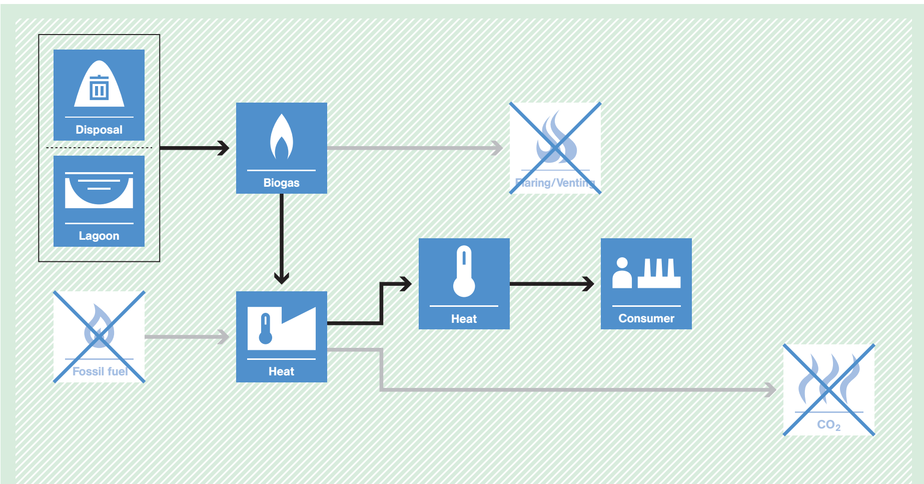
AM0075 Methodology for collection, processing and supply of biogas to end-users for production of heat

Typical project(s)	Processing and upgrading the biogas collected from biogas producing site(s) in a new biogas processing facility and supplying it to existing end-user(s) to produce heat in heat generation equipments for on-site use.
Type of GHG emissions mitigation action	• GHG destruction; • Renewable energy. Switching from more-carbon-intensive fuel to biogas that was previously flared or vented.
Important conditions under which the methodology is applicable	• The biogas is obtained from one or several existing biogas producing site(s) that have to be identified ex-ante; • The biogas was either vented or flared prior to implementation of the project. • All heat generation equipments included in the project have to be identified ex-ante, and it has to be demonstrated that these were using only fossil fuel prior to implementation of the project; • Any transportation of biogas or processed biogas occurs only through dedicated pipelines or by road vehicles.
Important parameters	Monitored: • Amount and net calorific value of processed biogas supplied to the boiler or heat generation equipment(s); • Amount of the steam or heat produced in the boiler or heat generation equipment(s); • Amount and net calorific value of fossil fuel used in the boiler or heat generation equipment.

BASELINE SCENARIO
Use of fossil fuel in heat generation equipments and biogas is flared or vented.



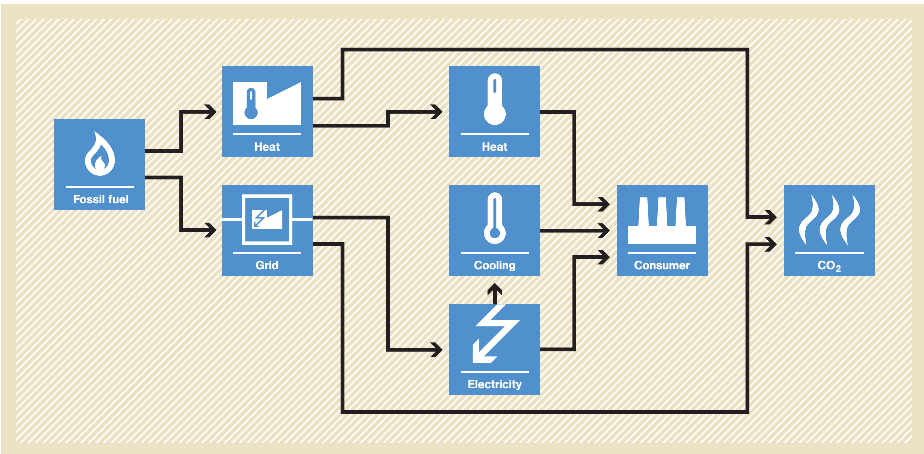
PROJECT SCENARIO
Upgraded biogas burned in the heat generation equipments avoiding the use of fossil fuel.



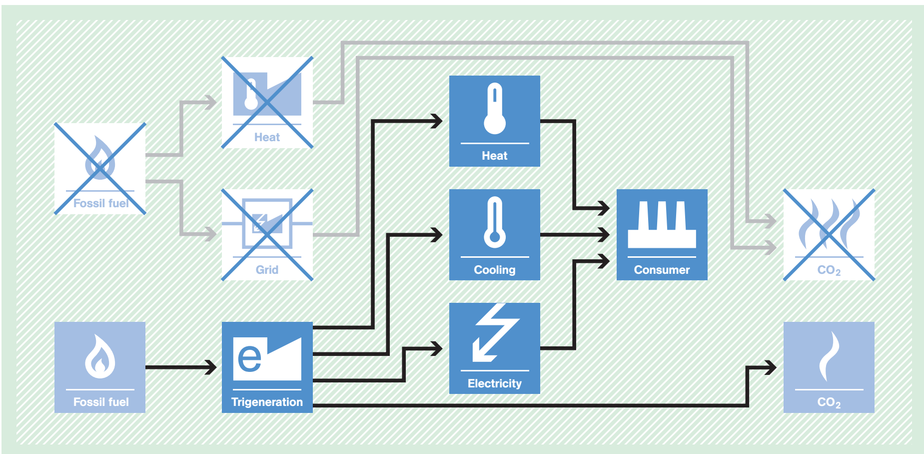
AM0076 Methodology for implementation of fossil fuel trigeneration systems in existing industrial facilities

Typical project(s)	Installation of an on-site fossil-fuel-based trigeneration plant to supply electricity, steam and chilled water to an industrial facility.
Type of GHG emissions mitigation action	• Energy efficiency. Displacement of electricity, heat and cooling that would be provided by more-carbon-intensive means.
Important conditions under which the methodology is applicable	• The baseline is the separate supply of electricity from the grid, heat supplied by an on-site fossil fuel fired boiler and chilled water from on-site electrical compression chillers. • There have been no cogeneration (CHP) or trigeneration (CCHP) systems operating in the industrial facility prior to the project; • No steam or chilled water is exported in the project; • Chillers in the project are heat driven (absorption chillers).
Important parameters	At validation: • Output efficiency of the baseline boiler; • Power consumption function of the baseline chiller.
	Monitored: • Electricity produced/purchased/sold by the trigeneration plant; • Quantity of fuels used in the trigeneration plant; • Quantity, temperature and pressure of steam produced by the trigeneration plant; • Quantity and temperature of chilled water produced by the trigeneration plant.

BASELINE SCENARIO
Separate supply of electricity from the grid, chilled water using grid electricity and steam by a fossil-fuel-fired boiler.



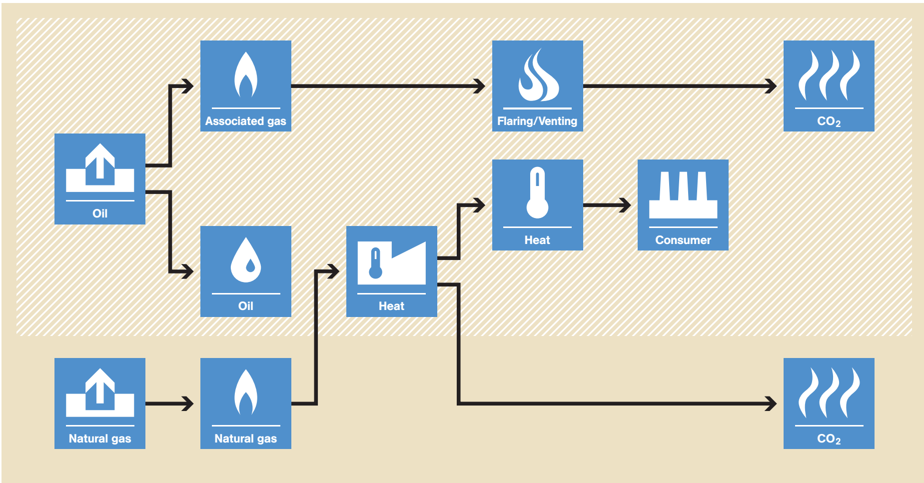
PROJECT SCENARIO
A fossil fuel-fired trigeneration plant generates directly at the industrial facility electricity, steam and chilled water resulting in overall lower CO_2 emissions.



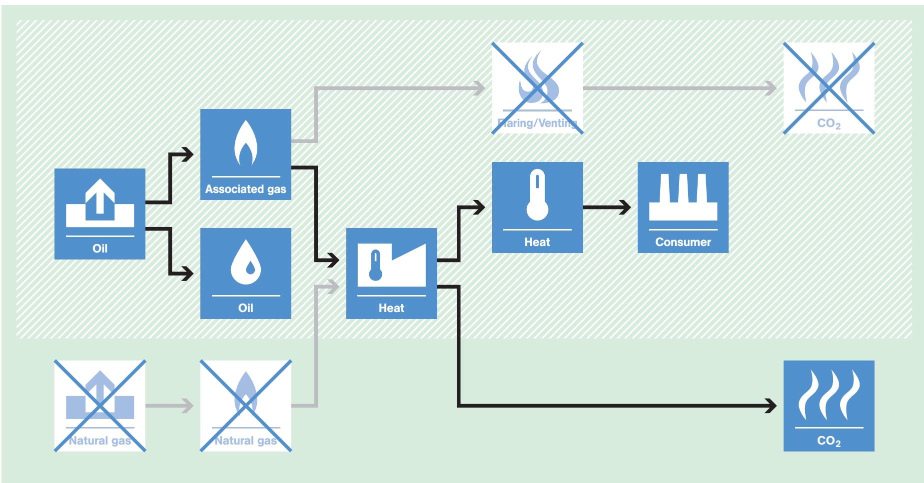
AM0077 Recovery of gas from oil wells that would otherwise be vented or flared and its delivery to specific end-users

Typical project(s)	Associated gas from oil wells that was previously flared or vented, is recovered and processed in a new gas processing plant along with, optionally, non-associated gas. The processed gas is delivered to clearly identifiable specific end-user(s) by means of CNG mobile units and/or delivered into an existing natural gas pipeline.
Type of GHG emissions mitigation action	• Fuel switch; Recovery of associated gas from oil wells that would otherwise be flared or vented for displacement of non-associated gas in a new gas processing plant.
Important conditions under which the methodology is applicable	• The recovered gas comes from oil wells that are in operation and producing oil at the time. Records of flaring or venting of the associated gas are available for at least three years; • The processed gas is consumed in the host country(ies) only; • If the project oil wells include gas-lift systems, the gas-lift gas has to be associated gas from the oil wells within the project boundary; • The natural gas can be used only in heat generating equipment.
Important parameters	Monitored: • Quantity and carbon content of gas measured at various points, i.e. recovered associated gas, non-associated gas from natural gas wells, gas or other fossil fuel consumed on site, gas delivered to end-user(s), gas delivered to natural gas pipeline; • If applicable: quantity and net calorific value of fuel consumed in vehicles for transportation of CNG.

BASELINE SCENARIO
Associated gas from oil wells is flared or vented and end users meet their energy demand using other fossil fuel.



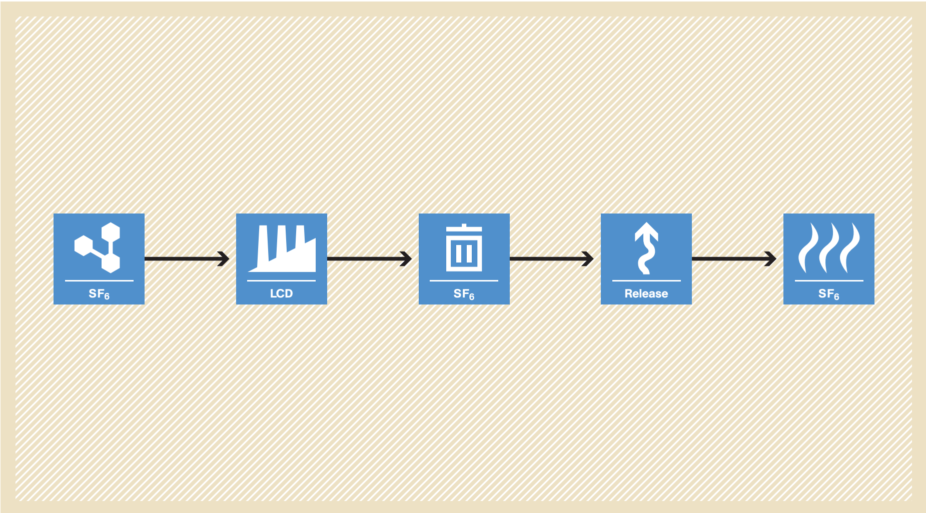
PROJECT SCENARIO
Associated gas from oil wells is recovered instead of flared or vented and displaces the use of other fossil fuel by the end-users.



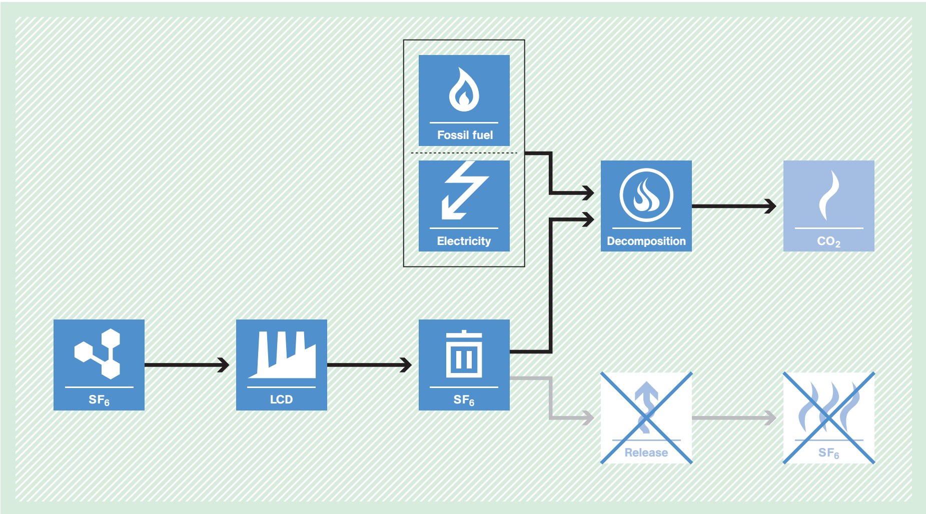
AM0078 Point of use abatement device to reduce SF_6 emissions in LCD manufacturing operations

Typical project(s)	Installation of a combustion or thermal abatement device to destroy SF_6 emissions from an LCD etching plant.
Type of GHG emissions mitigation action	• GHG destruction. Combustion or thermal destruction of SF_6 emissions.
Important conditions under which the methodology is applicable	• Production lines with at least three years of information about SF_6 purchase and consumption and production of LCD substrate by January 31, 2009; • There is no local law or regulation that mandates decomposition, destruction, recycling or substitution of SF_6 or any component of exhaust gases containing SF_6; • The SF_6 destruction should occur at the same industrial site where SF_6 is used, and the SF_6 destroyed is not imported from other facilities.
Important parameters	At validation: • SF_6 consumption in the most recent three years; • Production of LCD substrate in the most recent three years.
	Monitored: • Mass of SF_6 gas entering and existing the abatement device; • SF_6 consumption in the project; • Production of LCD substrate; • Electricity and/or fuel consumption for the operation of the abatement device.

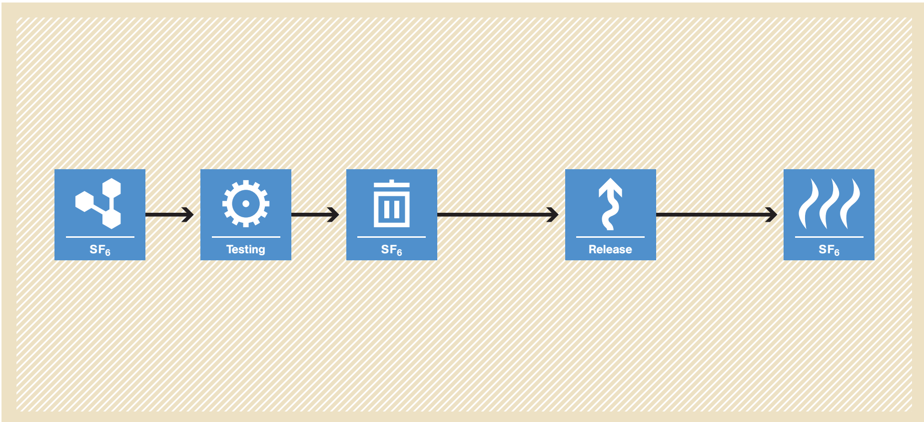
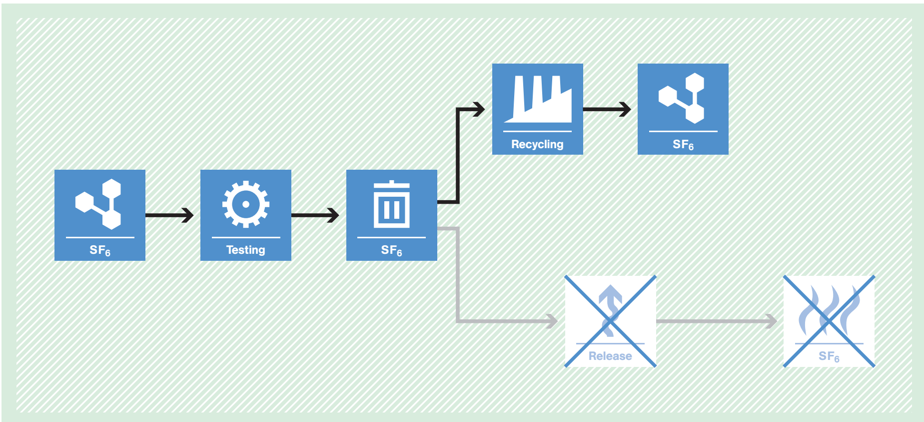
BASELINE SCENARIO
SF_6 is released to the atmosphere after being used in the etching of LCD units.



PROJECT SCENARIO
SF_6 is recovered and destroyed in an abatement unit located after the etching unit.



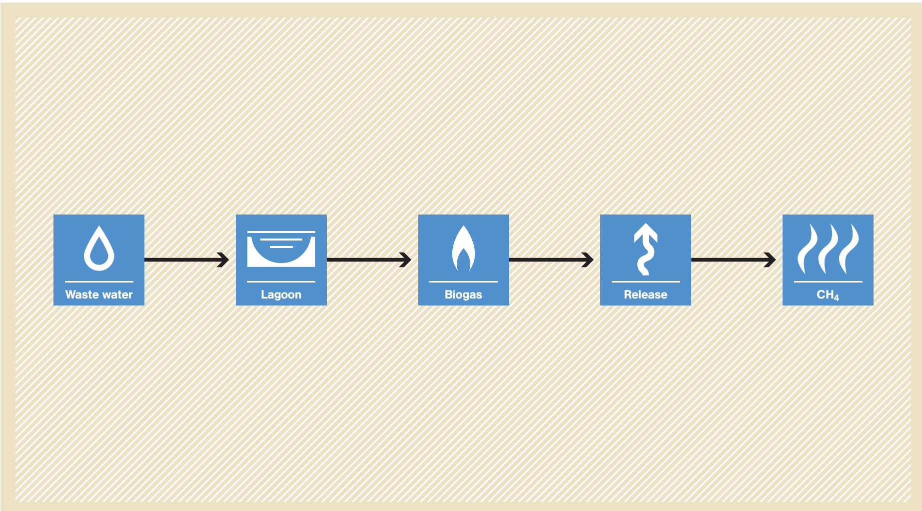
AM0079 Recovery of SF6 from gas insulated electrical equipment in testing facilities

Typical project(s)	Installation of a recovery system for used SF_6 gas that would be vented after the testing of gas-insulated electrical equipment at a testing facility, and then reclamation of the recovered SF_6 gas at an SF_6 production facility.
Type of GHG emissions mitigation action	• GHG formation avoidance. Avoidance of SF_6 emissions by recovery and reclamation of the SF_6 emissions.
Important conditions under which the methodology is applicable	• The SF_6 recovery site uses SF_6 in the testing of gas-insulated electrical equipment, which are performed as part of a rating process, or during development or production of new electrical equipment; • The recovered gas is reclaimed by using it as a feedstock in the production of new SF_6 on the premises of an existing SF_6 production facility; • The testing considered for the project is electrical tests of medium and high voltage rated equipment (>1 kV); • Before the project implementation, SF_6 gas used in the equipment for the tests is vented after testing.
Important parameters	At validation: • Mass of SF_6 that is vented during testing for at least one year of historical data; • Concentration of SF_6 in a recovery cylinder for at least one year of historical data.
	Monitored: • Mass of SF_6 that is filled into each gas-insulated electrical equipment; • Mass of SF_6 recovered at the recovery site and used as feedstock at the reclamation site; • Concentration of SF_6 in a recovery cylinder.
BASELINE SCENARIO SF_6 is released to the atmosphere after the completion of the test of a gas-insulated electrical equipment.	
PROJECT SCENARIO SF_6 used during the test is recovered and transported to a reclamation facility where the recovered gas will be re-injected in the stream to produce new SF_6.	

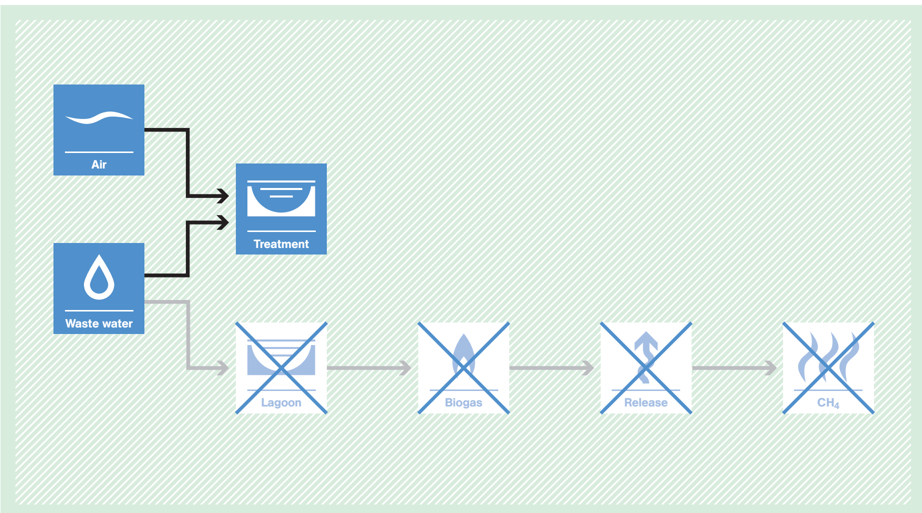
AM0080 Mitigation of greenhouse gases emissions with treatment of wastewater in aerobic wastewater treatment plants

Typical project(s)	Implementing a new aerobic wastewater treatment plant for the treatment of domestic and/or industrial wastewater, with sludge treated either in the same manner as the baseline, or in a new anaerobic digester with biogas capture. The biogas is either flared and/or used to generate electricity and/or heat.
Type of GHG emissions mitigation action	• GHG emission avoidance. Avoidance of CH_4 emissions from wastewater treatment.
Important conditions under which the methodology is applicable	• The project either replaces an existing anaerobic open lagoon system, with or without conversion of the sludge treatment system, or is an alternative to a new to be built anaerobic open lagoon system. • Loading in the wastewater streams has to be high enough to ensure that algal oxygen production can be ruled out in the baseline. • The average depth of the existing or new to be built anaerobic open lagoons system is at least one metre and residence time of the organic matter is at least 30 days.
Important parameters	Monitored: • Quantity and average chemical oxygen demand of the wastewater that is treated; • Electricity and heat generated with biogas from the new anaerobic digester, if applicable; • Quantity of produced sludge; • Fossil fuel, electricity and transportation needed to operate the project.

BASELINE SCENARIO
Wastewater would have been treated in an anaerobic open lagoon system without methane recovery and flaring. Sludge would have been dumped or left to decay, or dried under controlled and aerobic conditions and then disposed to a landfill with methane recovery or used in soil application.



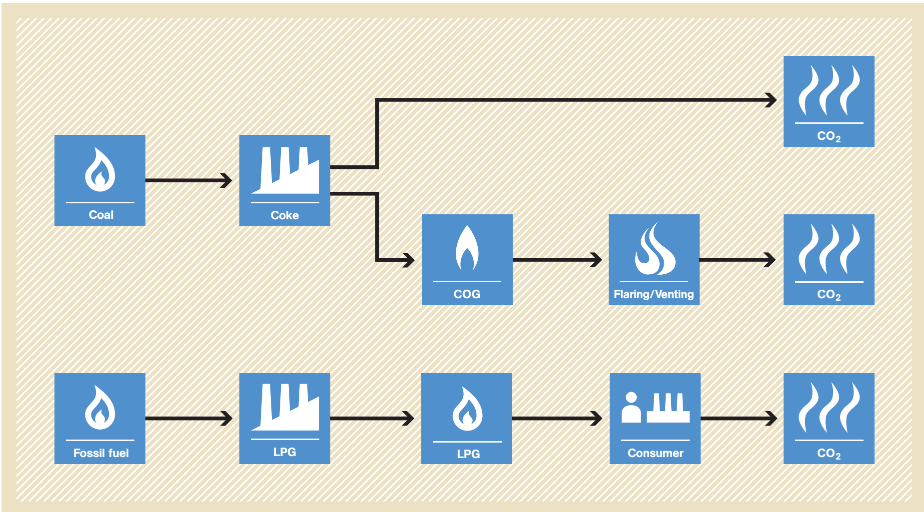
PROJECT SCENARIO
Installation of a new aerobic wastewater treatment plant. Sludge is treated either the same way as the baseline or in a new anaerobic digester with the biogas capture.



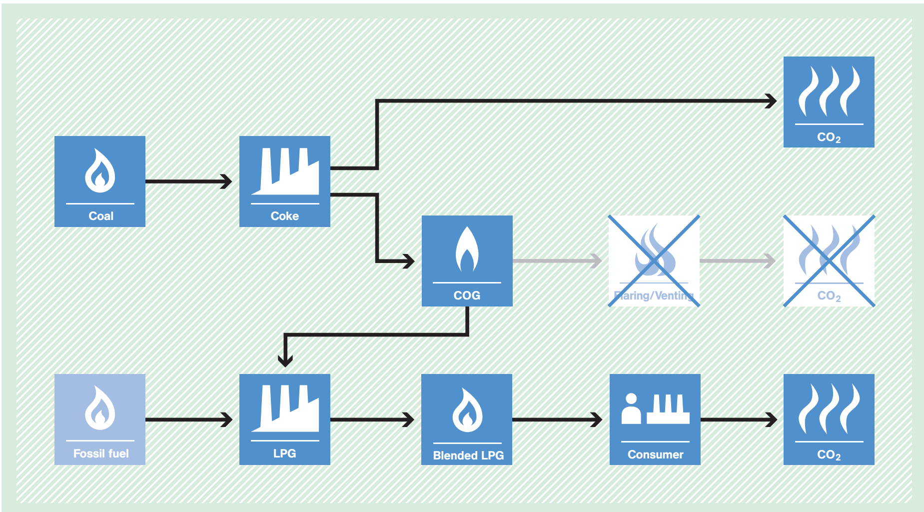
AM0081 Flare or vent reduction at coke plants through the conversion of their waste gas into dimethyl ether for use as a fuel

Typical project(s)	Construction of a new dimethyl ether (DME) facility to utilize a previously vented or flared stream of Coke Oven Gas (COG).
Type of GHG emissions mitigation action	• Fuel switch. Use of a previously vented source of carbon for the production of DME and use of DME for LPG blending.
Important conditions under which the methodology is applicable	• The project is a newly built DME plant which will supply DME to LPG processing facilities for blending purposes. • The history of the coke plant is the venting or flaring of COG for at least three years; • Bituminous coal remains the sole coking coal for the coke plant; • COG is the only carbon source used for DME production.
Important parameters	At validation: • Historical coal consumption and coke production in coke plants.
	Monitored: • The type and amount of coal consumed in each coke plant (for process and fuel); • The quantity of fossil fuels combusted as a result of the project (i.e. in the operation of the DME production facility or power plant); • Electricity consumption in DMR plant.

BASELINE SCENARIO
Venting or flaring of COG. Use of unblended LPG fuel resulting in high CO_2 emissions.



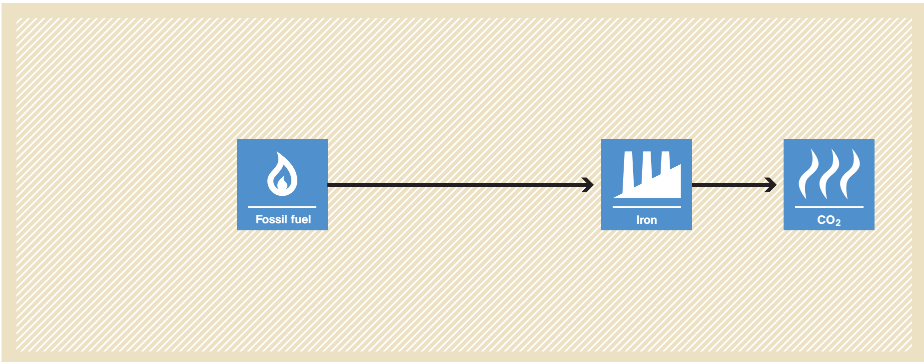
PROJECT SCENARIO
Use of all or part of the wasted COG to produce DME. This DME is supplied to LPG processing facilities for blending purpose. Thus, use of LPG is reduced.



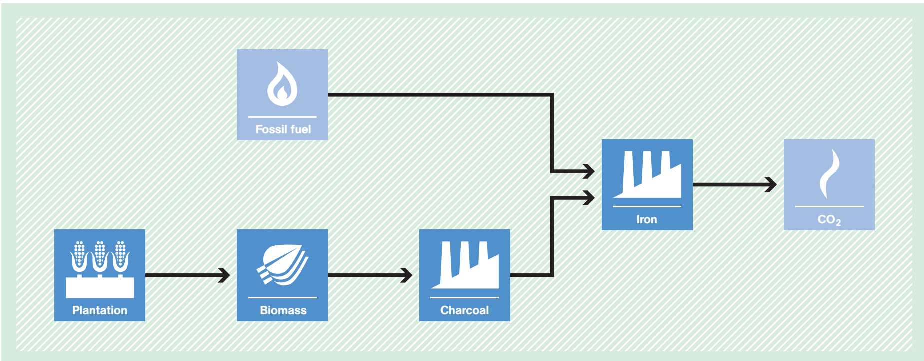
AM0082 Use of charcoal from planted renewable biomass in the iron ore reduction process through the establishment of a new iron ore reduction system

Typical project(s)	Use renewable reducing agents such as charcoal produced from dedicated plantations instead of fossil fuel based reducing agents, in the iron ore reduction process using blast furnace technology. The project should include one or combination of the following new investment types: investment in dedicated plantations for the supply of reducing agents; or establishment of specific long-term binding contracts for the supply of reducing agents; or refurbishment/replacement of blast furnace; or establishment/acquisition of blast furnace; or adaptation of existing blast furnace to the use of charcoal.
Type of GHG emissions mitigation action	• Renewable energy. Switch to a renewable source of carbon for the reduction of iron in blast furnaces.
Important conditions under which the methodology is applicable	• The renewable biomass used for charcoal production originates from a dedicated plantation in a tropical location of the host country where flood irrigation is not expected to take place; • The dedicated plantations should be located in the host country and under the control of project participants either directly owned or controlled through a long term contract; • Evidence should be available to demonstrate that the land of dedicated plantation falls into one of the following categories: grasslands; forest plantation after its last rotation or degraded areas; • The project does not use imported mineral coke or acquire biomass from the market.
Important parameters	At validation: • Carbonization yield.
	Monitored: • Parameters related to emissions from reducing agents production (carbonization and coal distillation); • Parameters related to iron ore reduction facility such as fuel/ reducing agent consumption, their emission factors, hot metal produced and its carbon content etc.

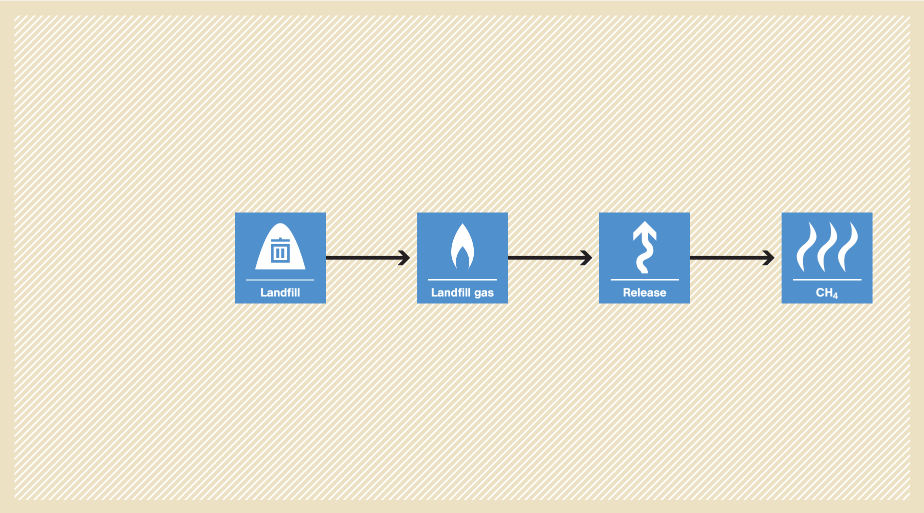
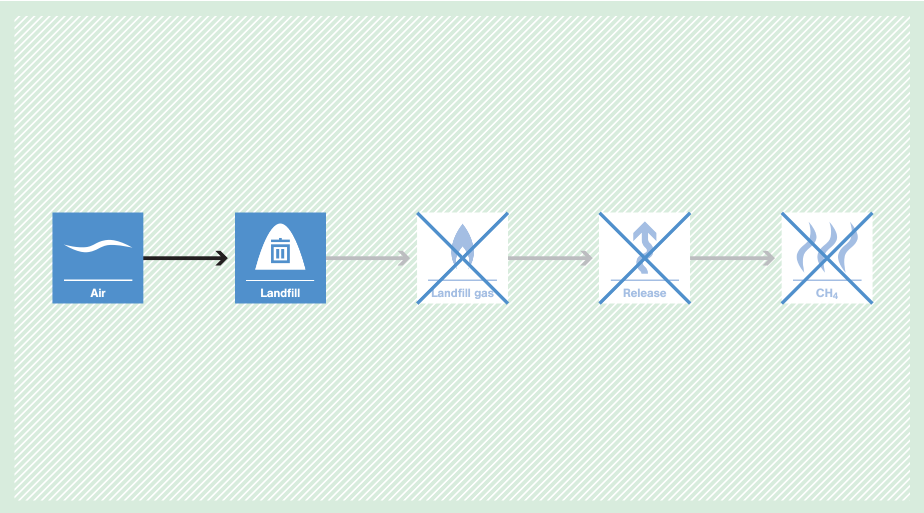
BASELINE SCENARIO
The hot metal in iron and steel plant is produced using reducing agents of fossil fuel origin, resulting into high amount of CO_2 emissions.



PROJECT SCENARIO
The new iron ore reduction system partially or fully replaces fossil-fuel-based reducing agent with charcoal of renewable origin, resulting into reduction of CO_2 emissions.



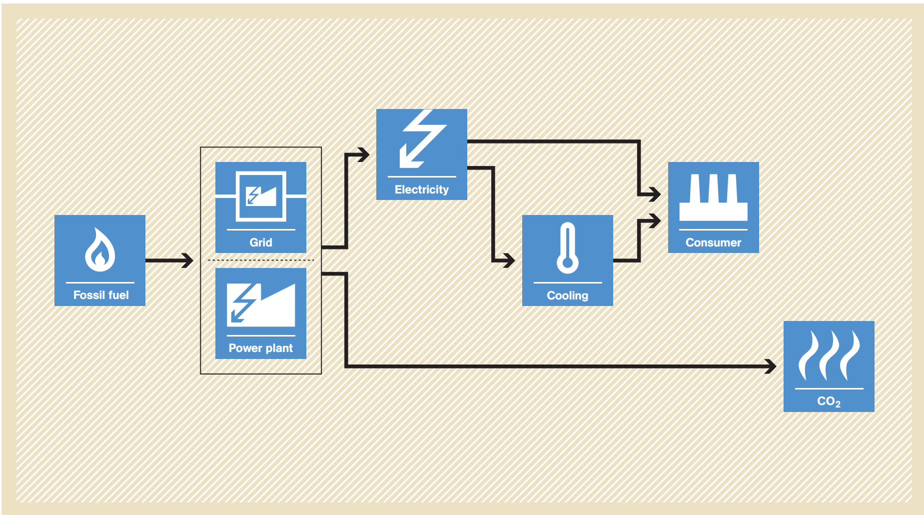
AM0083 Avoidance of landfill gas emissions by in-situ aeration of landfills

Typical project(s)	Landfilled waste is treated aerobically on-site by means of air venting (overdrawing) or low pressure aeration with the objective of avoiding anaerobic degradation processes.
Type of GHG emissions mitigation action	• GHG emission avoidance. The project avoids CH_4 emissions from landfills.
Important conditions under which the methodology is applicable	• Aeration techniques used are either air venting (overdrawing) or low pressure aeration; • Treatment of landfilled waste is in closed landfills or closed landfill cells; • If mandatory environmental regulations require the collection and flaring of landfill gas, the corresponding compliance rate is below 50% in the host country; • Closed cells of operating or closed landfills might be eligible as long as they are physically distinct from the remaining parts of the landfill.
Important parameters	Monitored: • Amount of degradable waste disposed in the landfill; • Potential methane generation capacity; • Vented and surface emissions: volume and methane and nitrous oxide content.
BASELINE SCENARIO Partial or total release of landfill gas from the closed landfill or the closed landfill cell.	
PROJECT SCENARIO In-situ aeration of the closed landfill or the closed landfill cell reduces GHG emissions.	

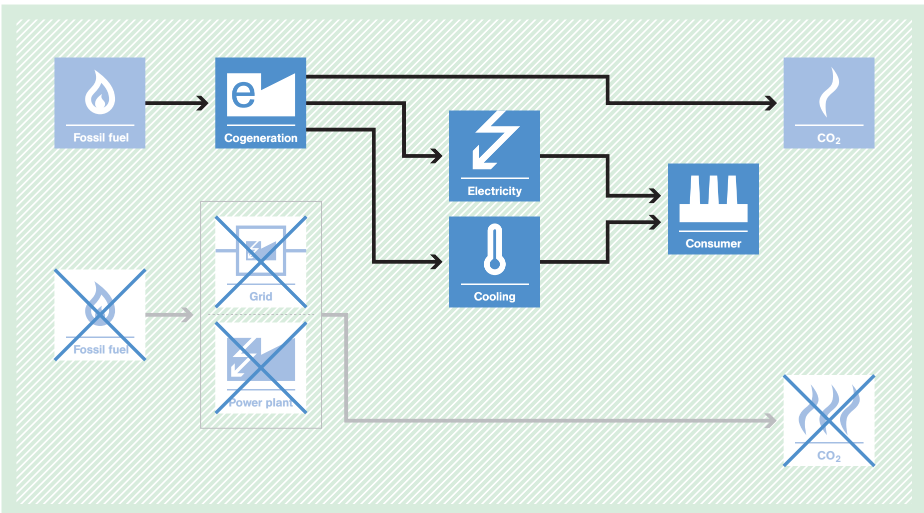
AM0084 Installation of cogeneration system supplying electricity and chilled water to new and existing consumers

Typical project(s)	Installation of a new cogeneration plant producing chilled water and electricity.
Type of GHG emissions mitigation action	• Energy efficiency Displacement of electricity and cooling that would be provided by more-carbon-intensive means.
Important conditions under which the methodology is applicable	• The chilled water is supplied by vapour compression chillers in the baseline and in the case of existing baseline facilities only used on-site by customers; • After the implementation of the project, the cogeneration facility cannot supply services to facilities that are outside the project boundary. • The demand of electricity and water at a consumer cannot exceed 110% of its historical level for a cumulative period longer than three months.
Important parameters	At validation: • Power consumption of the baseline vapour compression chiller(s)
	Monitored: • Electricity generated and consumed by the project; • Chilled water generated by the project.

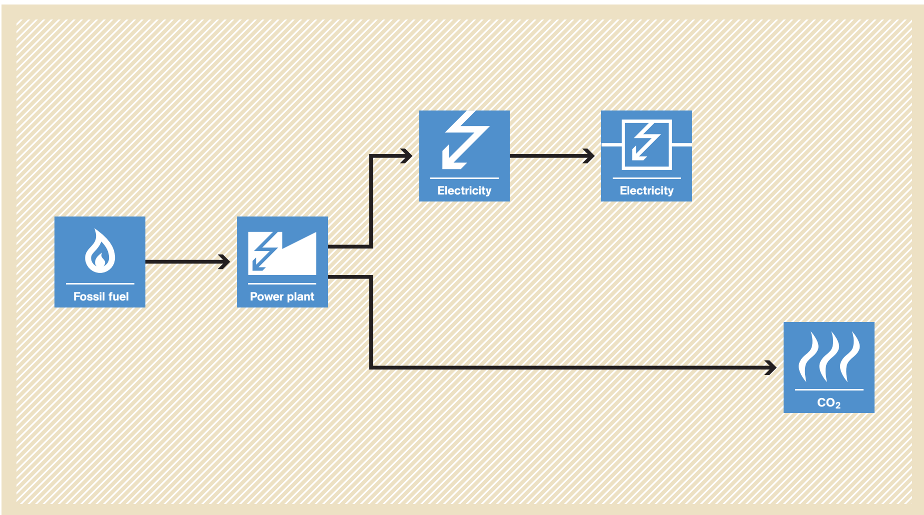
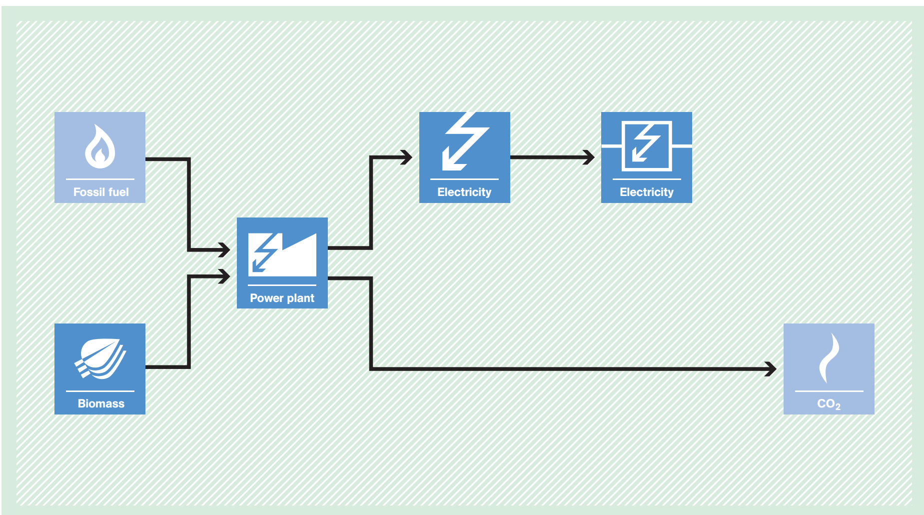
BASELINE SCENARIO
Consumers use electricity provided by an on-site power plant or by the grid. Consumption of electricity for the production of chilled water by the use of electrical chillers (vapour compression chillers).



PROJECT SCENARIO
Consumers use electricity provided by a fossil-fuel-fired cogeneration system. The cogeneration system provides electricity and chilled water.



AM0085 Co-firing of biomass residues for electricity generation in grid connected power plants

Typical project(s)	Construction and operation of a power plant that co-fires biomass residues with fossil fuel and supplies electricity to the grid or partial replacement of fossil fuel by biomass to operate an existing power plant that supplies electricity to the grid.
Type of GHG emissions mitigation action	• Renewable energy. Displacement of electricity that would be provided by more-GHG-intensive means.
Important conditions under which the methodology is applicable	• The project power plant generates only electricity and does not co-generate heat; • The amount of biomass residues co-fired in the project power plant shall not exceed 50% of the total fuel fired on an energy basis and the biomass residues used by the project power plant should not be stored for more than one year; • No significant energy quantities, except from transportation or mechanical treatment of the biomass residues, are required to prepare the biomass residues for fuel combustion; • In the case of fuel switch projects in existing power plants: the existing power plant did not co-fire any biomass prior to the implementation of the project.
Important parameters	Monitored: • Type, quantity, and calorific value of the biomass used in the project; • Project emissions from transport of biomass.
BASELINE SCENARIO Fossil fuel is used for power generation.	
PROJECT SCENARIO Power generation based on co-combustion of biomass residues in a power plant.	

AM0086 Installation of zero energy water purifier for safe drinking water application

Typical project(s)

Water purifiers and their consumable cleaning kits, both of which do not utilize any energy for purifying the water as per the applicable national standard for the safe drinking water, are sold to consumers and used in a specific geographical area.

Type of GHG emissions mitigation action

- Energy efficiency.

Displacement of more GHG intensive technology/technique used for the purification of water.

Important conditions under which the methodology is applicable

- If the manufacturer of zero-energy water purifiers and consumable cleaning kits is a different entity than the seller, a contractual agreement between them is needed;
- The total market penetration of all zero-energy water purifiers is not more than 1% in each project area defined under project;
- The zero-energy water purifiers ensure that they cannot be used anymore once a cleaning kit has reached the end of its lifetime;
- A public distribution network supplying safe drinking water is absent in the geographical project area.

Important parameters

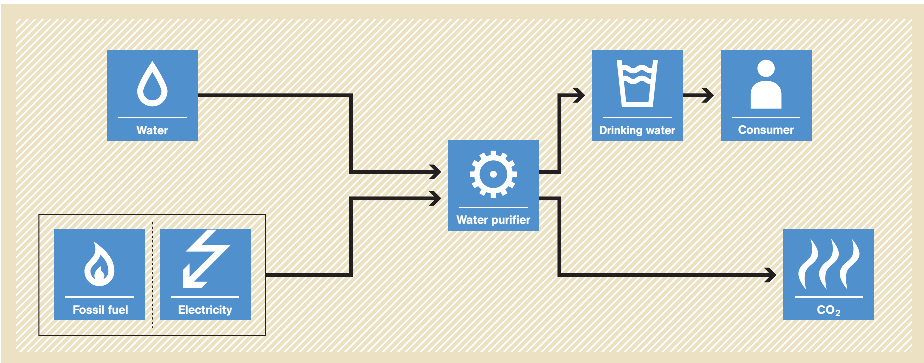
At validation:

- Average quantity of drinking water consumed in each household;
- CO_2 emission factor of water purifying technology/technique used in specific geographical area.

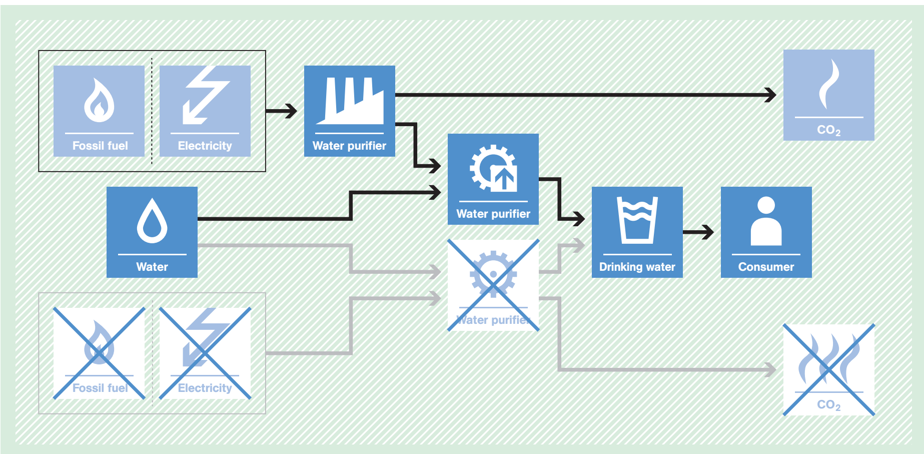
Monitored:

- Number of consumers in project area that have received the cleaning kits and number of kits sold to them or used cleaning kits collected from them.
- Specific amount of water that can be purified per kit (measured in laboratory for the sold kits).

BASELINE SCENARIO
Energy consuming applications to produce safe drinking water will continue to be used in the households of a specific geographical area.



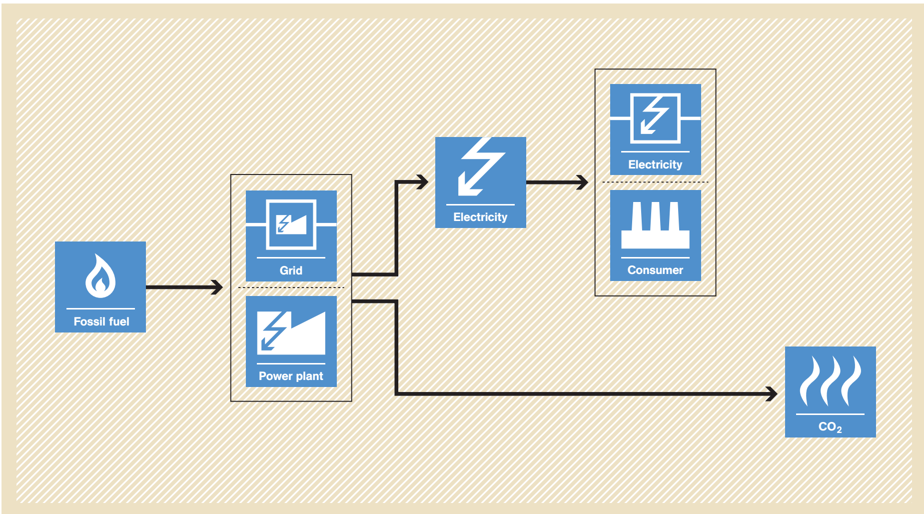
PROJECT SCENARIO
The zero-energy purifier displaces the current technologies/ techniques for generation of safe drinking water in the households of a specific geographical area.



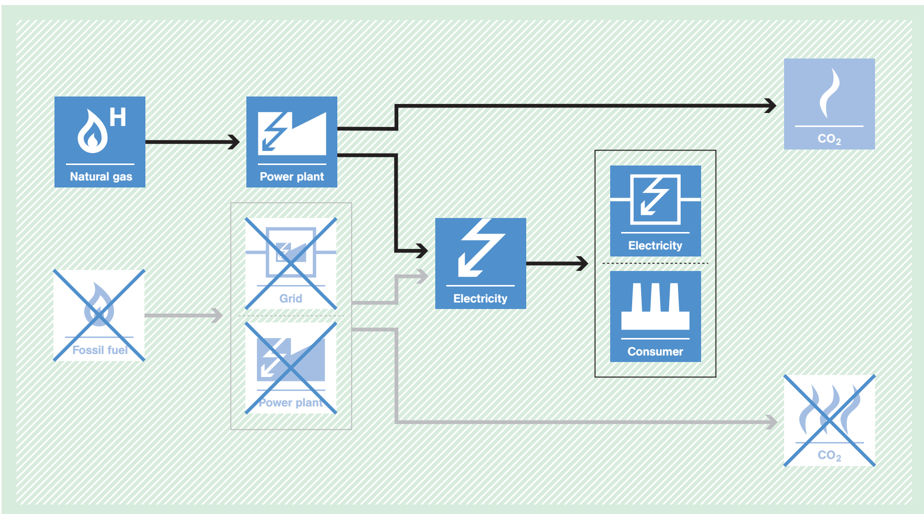
AM0087 Construction of a new natural gas power plant supplying electricity to the grid or a single consumer

Typical project(s)	Installation of a natural-gas-fired power plant that supplies electricity to a grid and/or an existing facility that is also connected to the grid.
Type of GHG emissions mitigation action	• Low carbon electricity. Displacement of electricity that would be provided by more-carbon-intensive means.
Important conditions under which the methodology is applicable	• The project power plant generates only electricity and does not cogenerate heat; • No power was generated at the site of the new power plant prior to the project implementation; • Natural gas is sufficiently available in the region or country; • In case electricity is supplied to an existing facility: The facility has an operational history of at least three years, and the electricity is supplied through a dedicated electric line.
Important parameters	At validation: • Emission factor of baseline electricity, derived from an emission factor of the power grid, the power generation technology that would most likely be used in the absence of the project, or the one currently used at the existing facility.
	Monitored: • Fuel consumption of the project power plant; • Electricity supplied to the electric power grid and/or an existing facility.

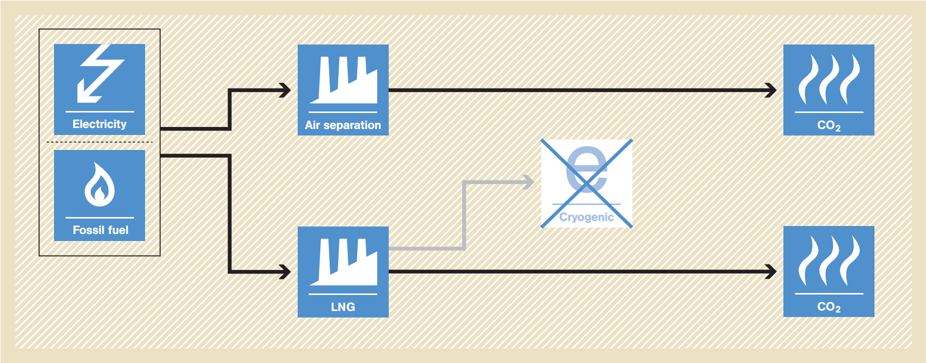
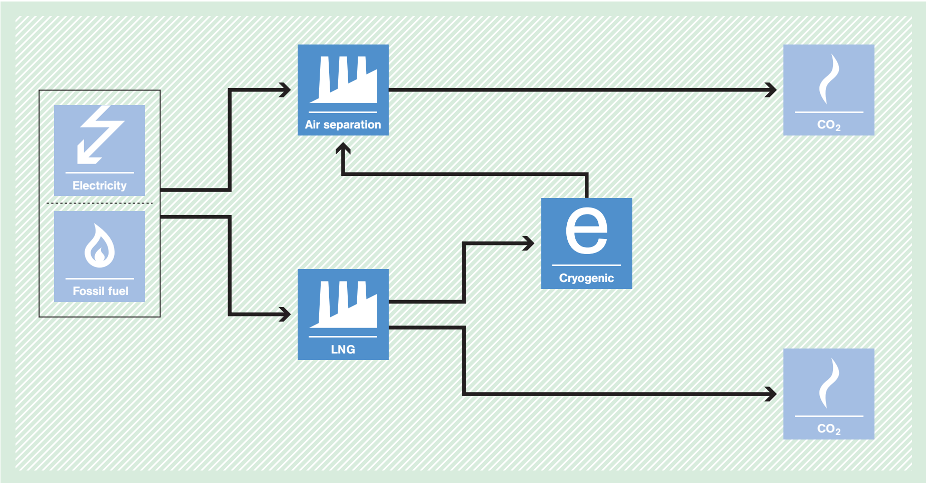
BASELINE SCENARIO
Power generation using
1) natural gas, but with different technologies than the project,
2) fossil fuels other than natural gas or renewable energy, or
3) new or existing captive power plants at the existing facility or import of electricity from the grid.



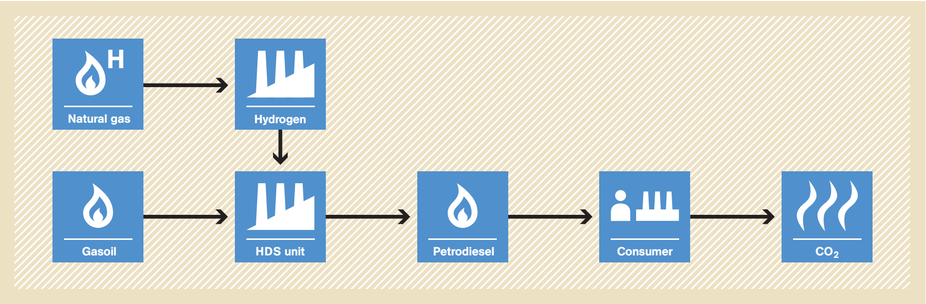
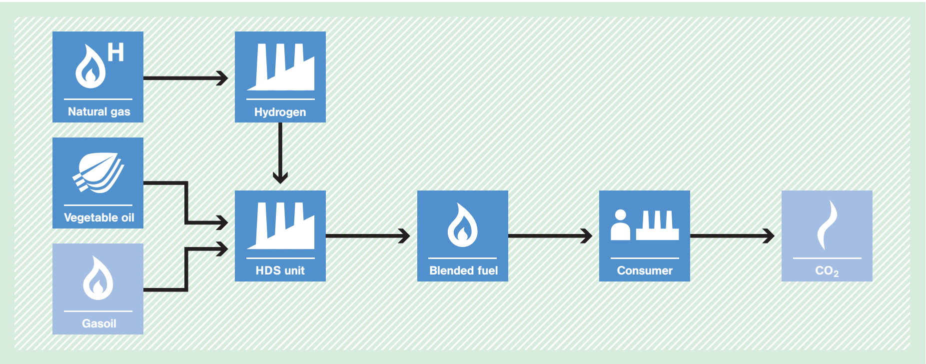
PROJECT SCENARIO
Power supply to the grid and/or an existing facility by a new natural-gas-fired power plant.



AM0088 Air separation using cryogenic energy recovered from the vaporization of LNG

Typical project(s)	The construction and operation of a new air separation plant that utilizes the cryogenic energy recovered from a new or existing LNG vaporization plant for the air separation process.
Type of GHG emissions mitigation action	• Energy efficiency. Reduction in heat consumption for LNG vaporization and fuels/electricity use in air separation plants.
Important conditions under which the methodology is applicable	• The purity of the oxygen and nitrogen produced by the new air separation plant is equal to or higher than 99.5 %; • The new air separation plant is located at the same site as the LNG vaporization plant • The cryogenic energy from existing LNG vaporization plant was not utilized for useful purposes and was being wasted prior to the implementation of the project.
Important parameters	At validation: • Electricity emission factor (can also be monitored ex post); • Quantity of fossil fuels and electricity consumed by the air separation and the LNG Vaporization facilities; • Amount and physical properties of LNG vaporized.
	Monitored: • Quantity of fossil fuels and electricity consumed by the Air Separation and the LNG Vaporization facilities; • Amount and physical properties of LNG vaporized and gas produced at the separation plant.
BASELINE SCENARIO The air separation process would use fossil fuels or electricity for cooling.	
PROJECT SCENARIO The air separation process use cryogenic energy recovered from a LNG vaporization plant for cooling.	

AM0089 Production of diesel using a mixed feedstock of gasoil and vegetable oil

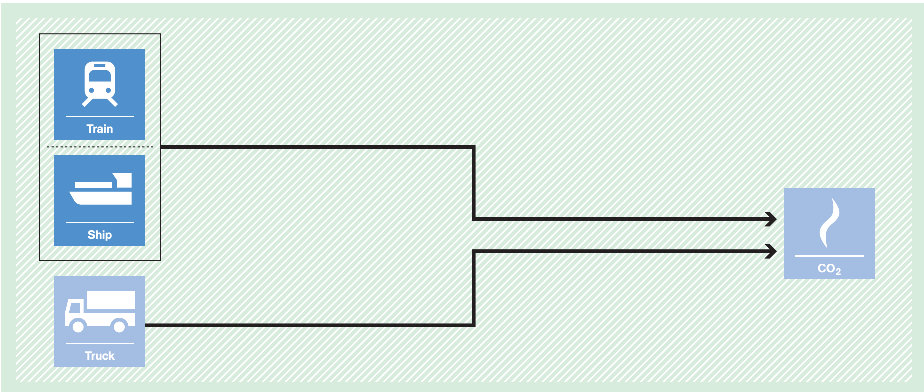
Typical project(s)	Production of petro/renewable diesel by switching the feedstock of hydrodesulphurization process (HDS) unit from 100% gasoil to a mixture of gasoil and vegetable oil in an existing refinery, where the vegetable oil comes from oilseeds from plants that are cultivated on dedicated plantations established on lands that are degraded or degrading at the start of the project.
Type of GHG emissions mitigation action	• Renewable energy. • Feedstock switch. Displacement of more-GHG-intensive feedstock for the production of diesel.
Important conditions under which the methodology is applicable	• Three years of historical data are required for the HDS unit; • Energy consumption in the HDS unit under the project is lower or equal to the baseline scenario and any combustible gases and off-gases formed during the hydrogenation of vegetable oil have to be flared or used in the refinery as fuel; • The petro/renewable diesel is supplied to consumers within the host country for combustion in existing stationary installations and/or in captive fleet of vehicles and only petro/renewable diesel consumed in excess of mandatory regulations is eligible; • The consumer and the producer of the petro/renewable diesel are bound by a contract that allows the producer to monitor the consumption of petro/renewable diesel and that states that the consumer shall not claim CERs resulting from its consumption.
Important parameters	At validation: • Ratio between the amount of renewable diesel produced and vegetable oil fed into HDS unit, density of renewable diesel.
	Monitored: • Amount of vegetable oil fed to HDS unit, volume of H_2 consumed in the HDS unit and amount of petro/renewable diesel produced by the project; • Project emissions from transport of oilseeds and/or vegetable oil if distances more than 50 km are covered; fossil fuel and electricity consumption of the vegetable oil production plant; • Leakage emissions related to the upstream emissions of excess natural gas and positive leakage associated with the avoided production of petrodiesel.
BASELINE SCENARIO Diesel is produced from gasoil.	
PROJECT SCENARIO Diesel is produced from mixture of gasoil and vegetable oil.	

AM0090 Modal shift in transportation of cargo from road transportation to water or rail transportation

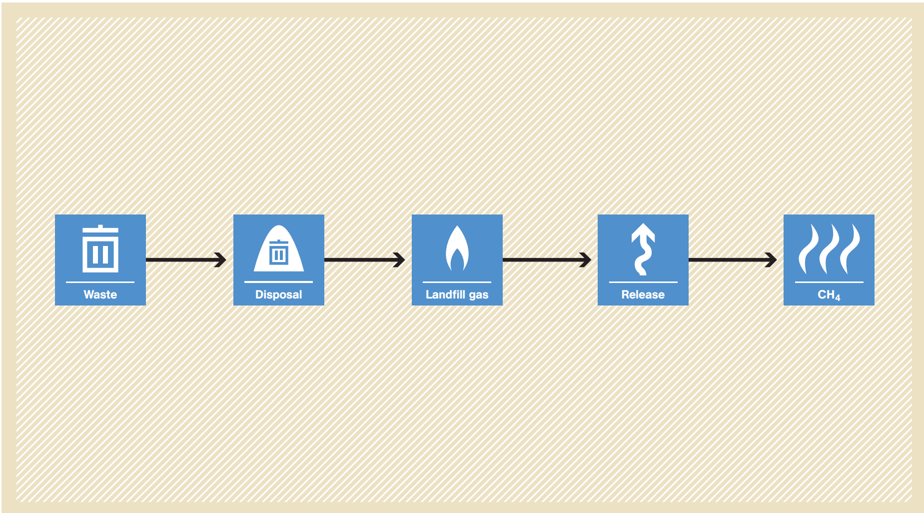
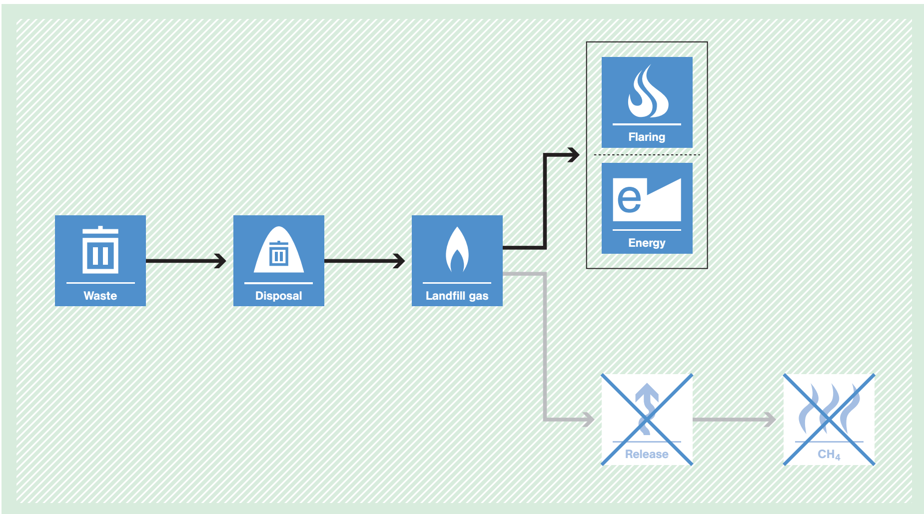
Typical project(s)	Transportation of cargo using barges, ships or trains.
Type of GHG emissions mitigation action	• Energy efficiency. Displacement of a more-carbon-intensive transportation mode.
Important conditions under which the methodology is applicable	• The owner of the cargo is one of the project participants. If the entity investing in the project is not the owner of the cargo, it should also be a project participant; • The project should have made at least one of the following new investments: direct investment in new infrastructure for water transportation or for rail transportation, or refurbishment/replacement of existing water and rail transportation infrastructure or equipments, with transport capacity expansion; • The cargo type, transportation mode, and transportation routes of the project are defined at the validation of the project and no change is allowed thereafter; • Both in the baseline and project, only one type of cargo is transported and no mix of cargo is permitted.
Important parameters	At validation: • Distance of the baseline trip route (both forward and return trips). Monitored: • Fuel and/or electricity consumption by the project transportation mode; • Amount of cargo transported by the project transportation mode (both forward and return trips).

BASELINE SCENARIO
The cargo is transported using trucks.

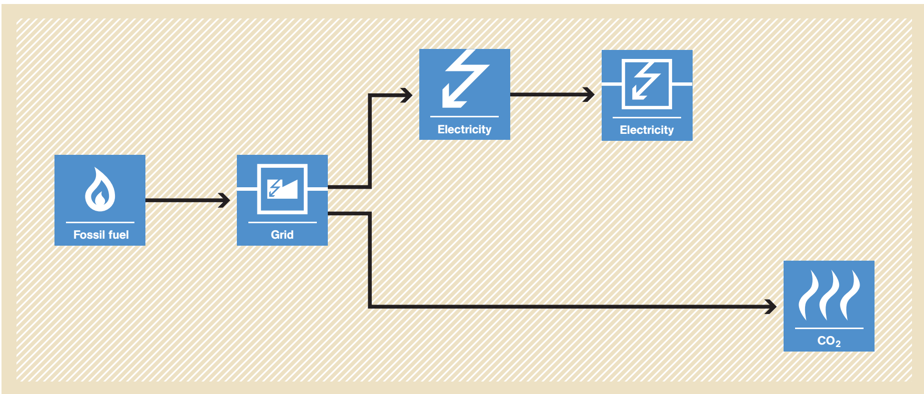
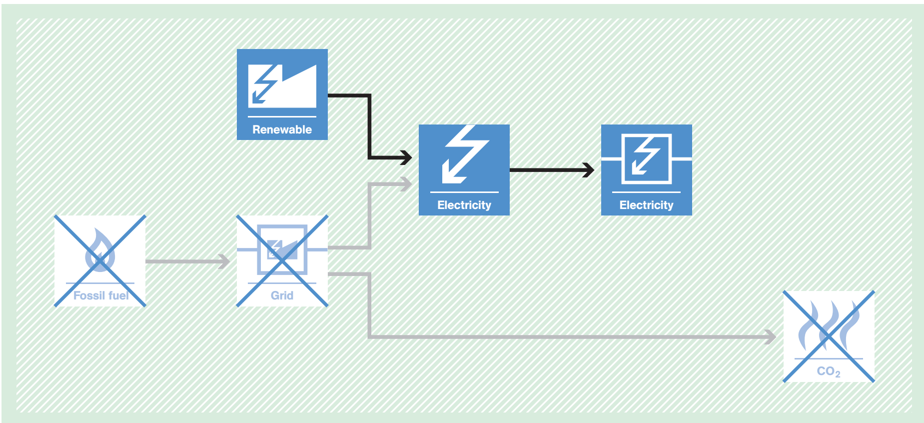
PROJECT SCENARIO
The cargo is transported using barges, ships or trains.



ACM0001 Consolidated baseline and monitoring methodology for landfill gas project activities

Typical project(s)	Capture of landfill gas (LFG) and its flaring and/or use to produce energy and/or use to supply consumers through natural gas distribution network.
Type of GHG emissions mitigation action	• GHG destruction. Destruction of methane emissions and displacement of a more-GHG-intensive service.
Important conditions under which the methodology is applicable	• Captured landfill gas is flared, and/or; • Captured landfill gas is used to produce energy, and or; • Captured gas is used to supply consumers through natural gas distribution network.
Important parameters	Monitored: • Amount of landfill gas captured; • Methane fraction in the landfill gas; • If applicable: electricity generation using landfill gas.
BASELINE SCENARIO LFG from the landfill site is released to the atmosphere	
PROJECT SCENARIO LFG from the landfill site is captured and flared; and/or used to produce energy (e.g. electricity/thermal energy); and/or used to supply consumers through natural gas distribution network.	

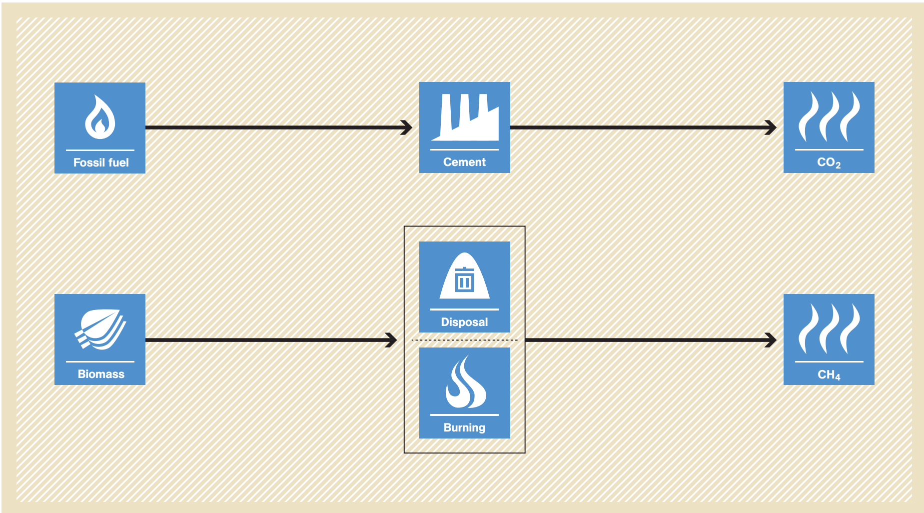
ACM0002 Consolidated baseline methodology for grid-connected electricity generation from renewable sources

Typical project(s)	Construction and operation of a power plant that uses renewable energy sources and supplies electricity to the grid (greenfield power plant). Retrofit, replacement or capacity addition of an existing power plant is also applicable.
Type of GHG emissions mitigation action	• Renewable Energy. Displacement of electricity that would be provided to the grid by more-GHG-intensive means.
Important conditions under which the methodology is applicable	• The project power plant is using one of the following sources: hydro, wind, geothermal, solar, wave or tidal power. Biomass-fired power plants are not applicable; • In the case of capacity additions, retrofits or replacements, the existing power plant started commercial operation prior to the start of a minimum historical reference period of five years, and no capacity expansion or retrofit of the plant has been undertaken between the start of this minimum historical reference period and the implementation of the project; • In case of hydro power, the project has to be implemented in an existing reservoir, with no change in the volume of reservoir, or the project has to be implemented in an existing reservoir, where the volume of reservoir is increased and the power density is greater than 4 W/m^2, or the project results in new reservoirs and the power density is greater than 4 W/m^2.
Important parameters	At validation: • Grid emission factor (can also be monitored ex post).
	Monitored: • Electricity supplied to the grid by the project; • If applicable: methane emissions of the project.
BASELINE SCENARIO Electricity provided to the grid by more-GHG-intensive means.	
PROJECT SCENARIO Displacement of electricity provided to the grid by more-GHG-intensive means by installation of a new renewable power plant or the retrofit, replacement or capacity addition of an existing renewable power plant.	

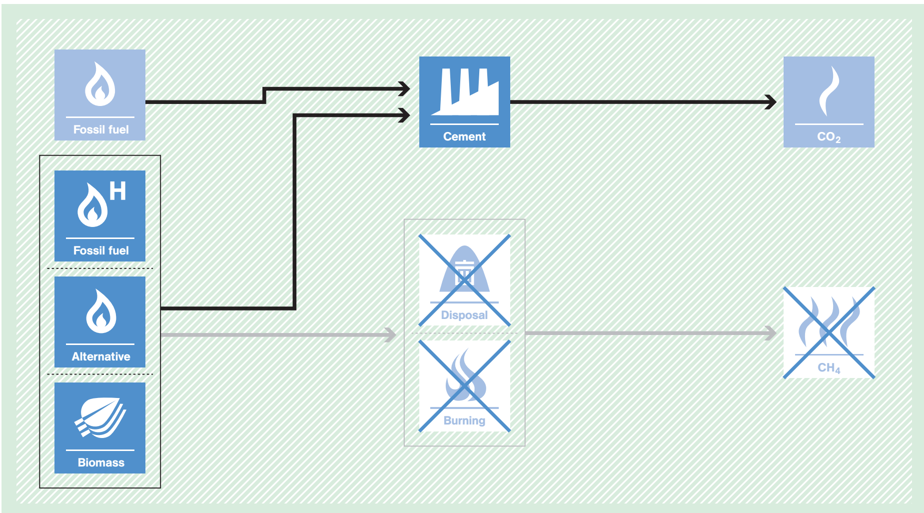
ACM0003 Emissions reduction through partial substitution of fossil fuels with alternative fuels or less carbon intensive fuels in cement manufacture

Typical project(s)	Partial replacement of fossil fuels in an existing clinker production facility by less-carbon-intensive fossil fuel or alternative fuel (e.g. wastes or biomass residues).
Type of GHG emissions mitigation action	• Fuel switch; • Renewable energy. Reduction of GHG emissions by switching from carbon-intensive fuel to less-carbon-intensive or alternative fuel; GHG emission avoidance by preventing disposal or uncontrolled burning of biomass residues.
Important conditions under which the methodology is applicable	• No alternative fuels have been used in the project facility during the last three years prior to the start of the project; • The biomass to be combusted should not have been processed chemically; • For biomass from dedicated plantations, specific conditions apply.
Important parameters	Monitored: • Quantity and net calorific value of alternative fuel and/or less-carbon-intensive fossil fuel used in the project plant; • Quantity of clinker produced by the clinker facility.

BASELINE SCENARIO
Clinker is produced using more-carbon-intensive fuel and/or decay or uncontrolled burning of biomass leads to CH_4 emissions.



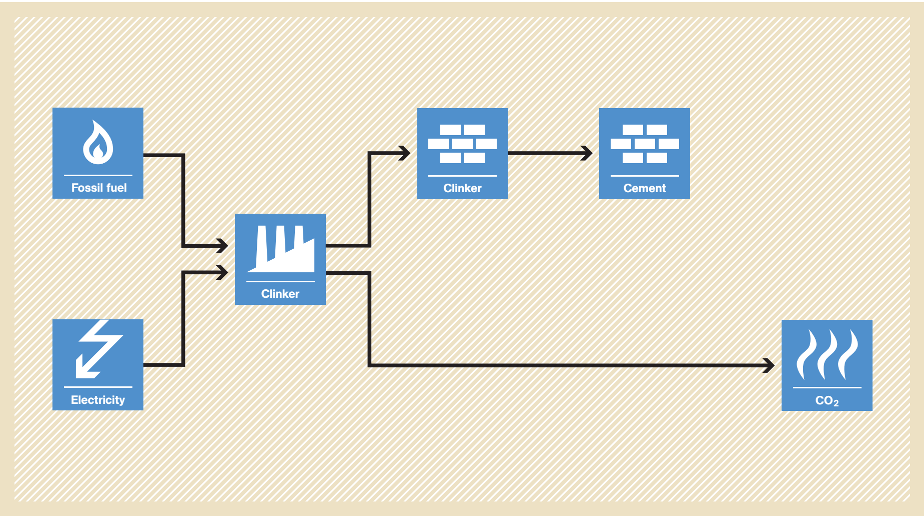
PROJECT SCENARIO
Clinker is produced using less-carbon-intensive fuel and/or alternative fuel and/or biomass is combusted.



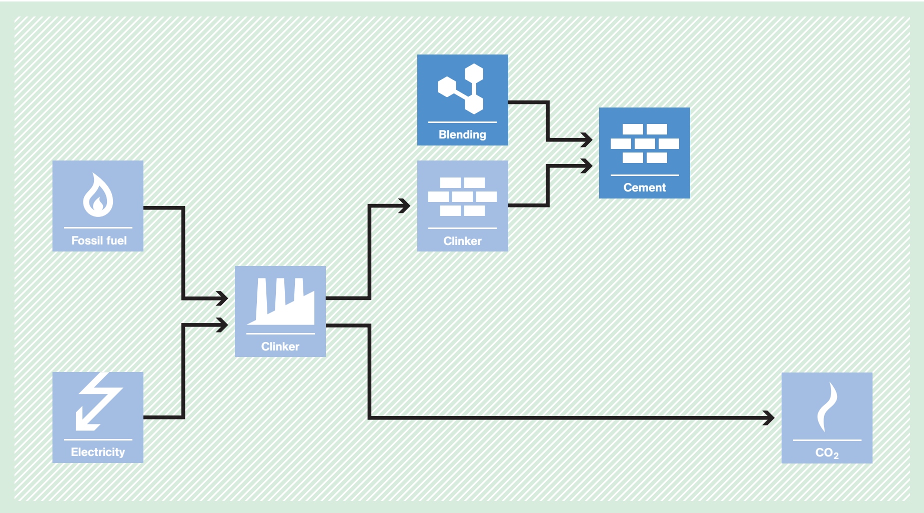
ACM0005 Consolidated Baseline Methodology for Increasing the Blend in Cement Production

Typical project(s)	Use of blending material (e.g. fly ash, gypsum, slag) to decrease the share of clinker in cement.
Type of GHG emissions mitigation action	• Feedstock switch. CO_2 emissions from clinker production are avoided due to less use of clinker.
Important conditions under which the methodology is applicable	• No shortage or current use for the blending material replacing clinker; • In case of existing facilities, three years of historical data is required for the calculation of emissions reductions.
Important parameters	At validation: • Clinker ratio at the project plant, clinker ratio at all other plants in the region and in the five highest blended cement brands in the region; • Electricity emission factor.
	Monitored: • Cement and clinker production; • Raw materials, electricity demand and fuel use in the production of clinker; • Clinker and additives use in the production of cement.

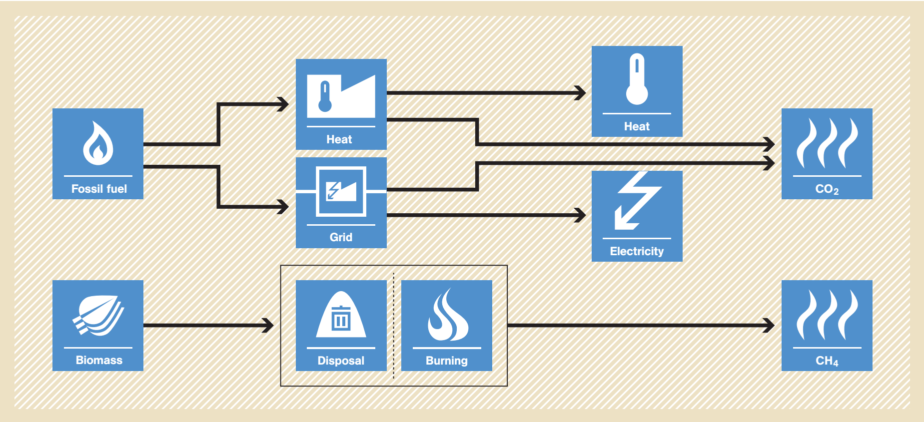
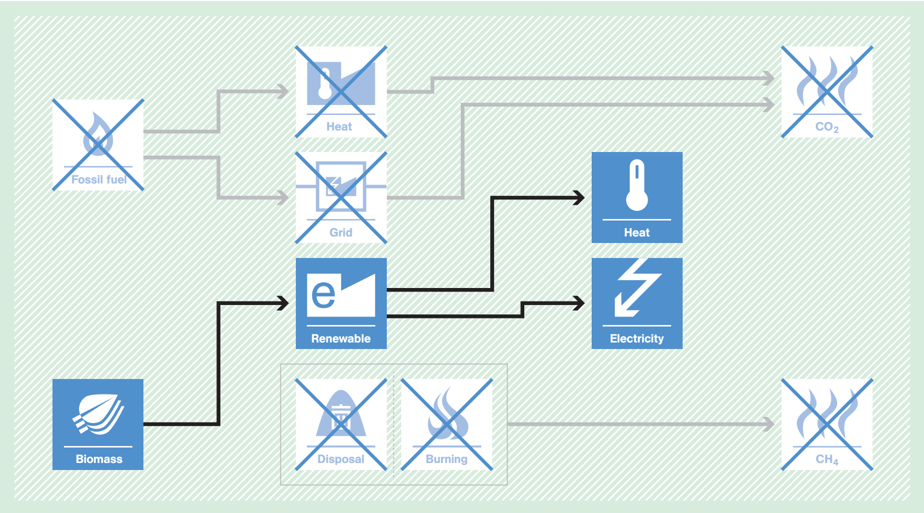
BASELINE SCENARIO
Available blending material is not used. Cement is produced with high clinker content, leading to high CO_2 emissions.



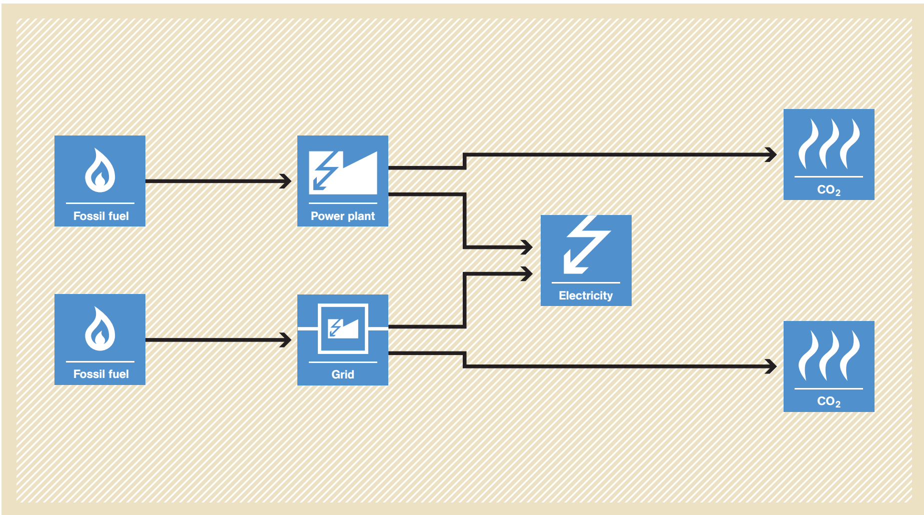
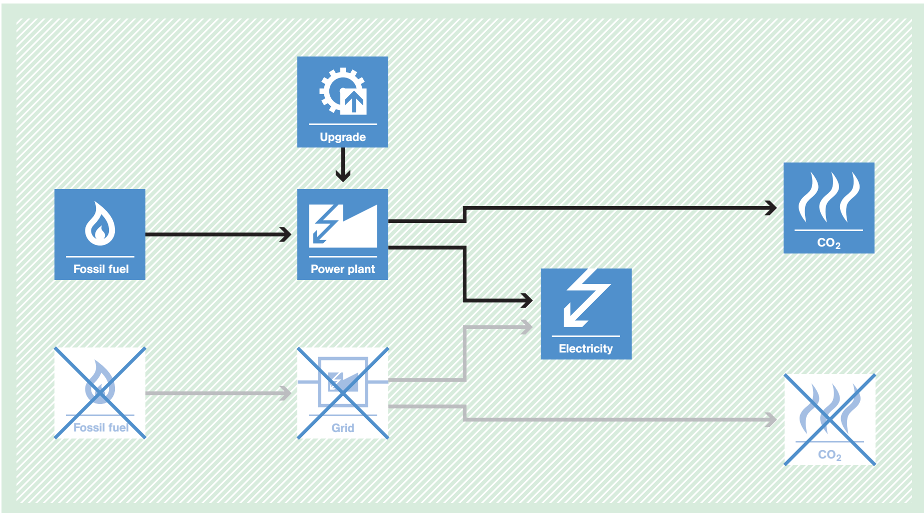
PROJECT SCENARIO
Available blending material is used in cement to partially replace clinker. Thereby CO_2 emissions from clinker production are avoided.



ACM0006 Consolidated methodology for electricity and heat generation from biomass residues

Typical project(s)	Generation of power and heat in thermal power plants, including cogeneration plants using biomass residues. Typical activities are new plant, capacity expansion, energy efficiency improvements or fuel switch projects.
Type of GHG emissions mitigation action	• Renewable Energy. Displacement of more-GHG-intensive electricity generation in grid or heat and electricity generation on-site. Avoidance of methane emissions from anaerobic decay of biomass residues.
Important conditions under which the methodology is applicable	• If biomass from a production process is used, the implementation of the project shall not result in an increase of the processing capacity of raw input; • Only power and heat or cogeneration plants are applicable; • Only biomass residues, not biomass in general, are eligible; • In case of existing facilities, three years of historical data is required for the calculation of emissions reductions.
Important parameters	At validation: • Grid emission factor (can also be monitored ex post).
	Monitored: • Quantity and moisture content of the biomass residues used in the project; • Electricity and heat generated in the project activity; • Electricity and, if applicable, fossil fuel consumption of the project activity.
BASELINE SCENARIO Electricity and heat would be produced by more-carbon-intensive technologies based on fossil fuel or less-efficient biomass power and heat plants. Biomass residues could partly decay under anaerobic conditions, bringing about methane emissions.	
PROJECT SCENARIO Use of biomass residues for power and heat generation instead of fossil fuel or increase of the efficiency of biomass-fuelled power and heat plants. Biomass residues are used as fuel and decay of biomass residues is avoided.	

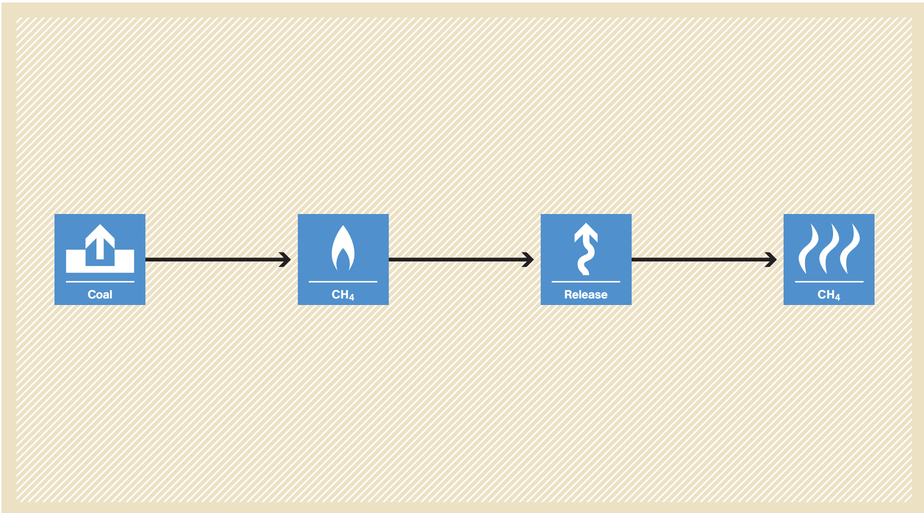
ACM0007 Consolidated methodology for conversion from single cycle to combined cycle power generation

<table>
<tr><td>Typical project(s)</td><td>Conversion from an open-cycle gas power plant to a combined-cycle gas power plant.</td></tr>
<tr><td>Type of GHG emissions mitigation action</td><td>• Energy efficiency.
Fuel savings through energy efficiency improvement.</td></tr>
<tr><td>Important conditions under which the methodology is applicable</td><td>• The project does not increase the lifetime of the existing gas turbine or engine during the crediting period;
• Waste heat generated on the project site is not utilizable for any other purpose.</td></tr>
<tr><td>Important parameters</td><td>At validation:
• Electricity generation of the existing open-cycle gas power plant (can also be monitored ex post);
• Fuel consumption of the existing open-cycle gas power plant.</td></tr>
<tr><td></td><td>Monitored:
• Electricity generation of the combined-cycle gas power plant;
• Fuel consumption of the combined-cycle gas power plant;
• Emission factor of the power grid.</td></tr>
<tr><td>BASELINE SCENARIO
Electricity is generated by an open-cycle gas power plant.</td><td>
</td></tr>
<tr><td>PROJECT SCENARIO
The open-cycle gas power plant is converted to a combined-cycle one for more-efficient power generation.</td><td>
</td></tr>
</table>

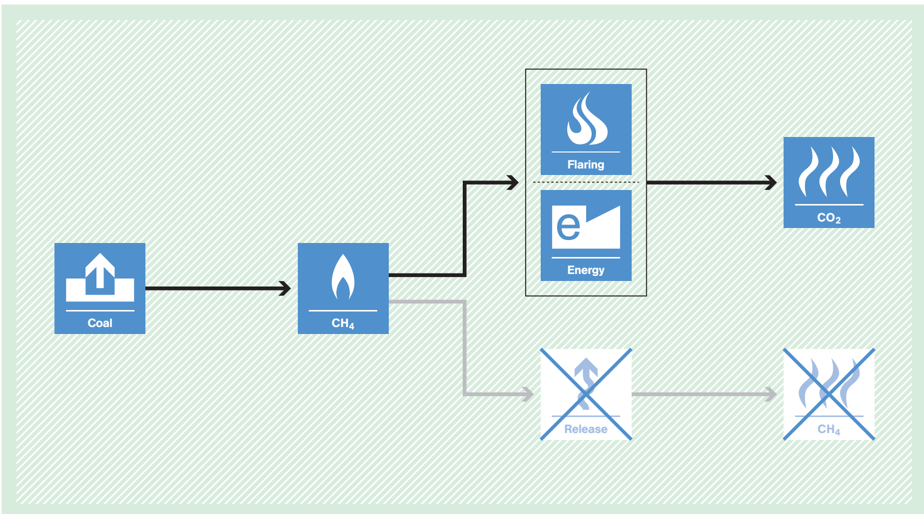
ACM0008 Consolidated methodology for coal bed methane, coal mine methane and ventilation air methane capture and use for power (electrical or motive) and heat and/or destruction through flaring or flameless oxidation

Typical project(s)	Capture and destruction of coal bed methane, coal mine methane or ventilation air methane through oxidation or energy generation, from new or existing coal mines.
Type of GHG emissions mitigation action	• GHG destruction. Destruction of methane emissions and displacement of more-GHG-intensive service.
Important conditions under which the methodology is applicable	• Project participants must be able to supply the necessary data for *ex ante* projections of methane demand; • All methane captured by the project should either be used or destroyed; • Not applicable for abandoned/decommissioned coalmines.
Important parameters	Monitored: • Methane destroyed or used; • Concentration of methane in extracted gas; • If applicable: electricity generated by project;

BASELINE SCENARIO
Methane from coal mining activities is vented into the atmosphere.



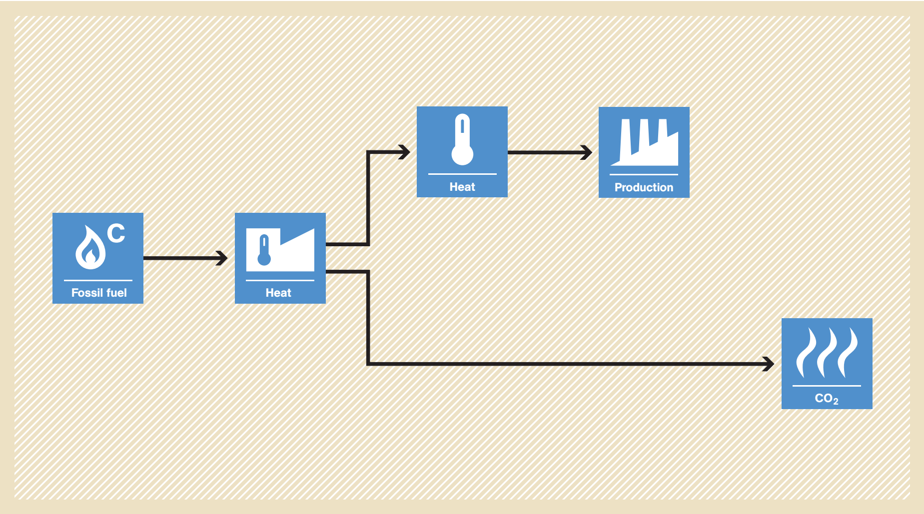
PROJECT SCENARIO
Methane from coal mining activities is captured and destroyed using oxidation or used for power or heat generation.



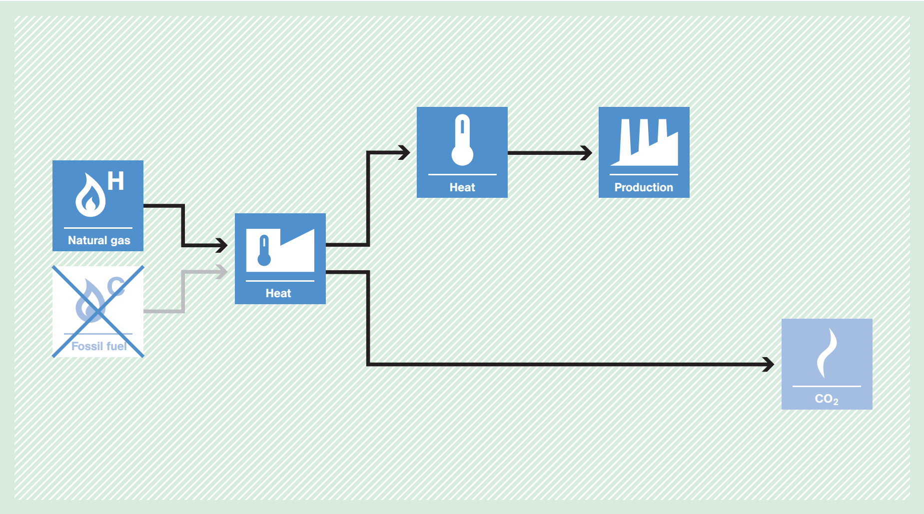
ACM0009 Consolidated baseline and monitoring methodology for fuel switching from coal or petroleum fuel to natural gas

Typical project(s)	Switching from coal or petroleum fuel to natural gas in the generation of heat for industrial processes.
Type of GHG emissions mitigation action	• Fuel switch. Reduction of GHG emissions by switching from carbon-intensive to a less-carbon-intensive fuel in the generation of heat.
Important conditions under which the methodology is applicable	• No natural gas has previously been used; • The fuel is neither used for cogeneration of electricity nor as an oxidant but generates heat for district heating or an industrial output other than heat; • The project does not increase the capacity of thermal output or lifetime of the element processes or does not result in integrated process change.
Important parameters	At validation: • Quantity, net calorific value and CO_2 emission factor of baseline fuels; • Energy efficiency of the element process(es) fired with coal or petroleum fuel.
	Monitored: • Quantity, net calorific value and CO_2 emission factor of natural gas combusted in the element process(es) in the project; • Energy efficiency of the element process(es) if fired with natural gas.

BASELINE SCENARIO
Coal or petroleum fuel is used to generate heat.



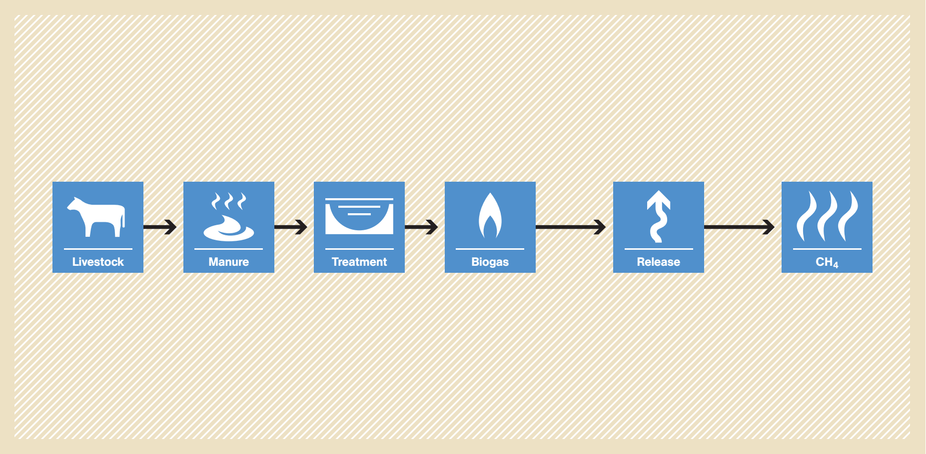
PROJECT SCENARIO
Natural gas replaces coal or petroleum fuel



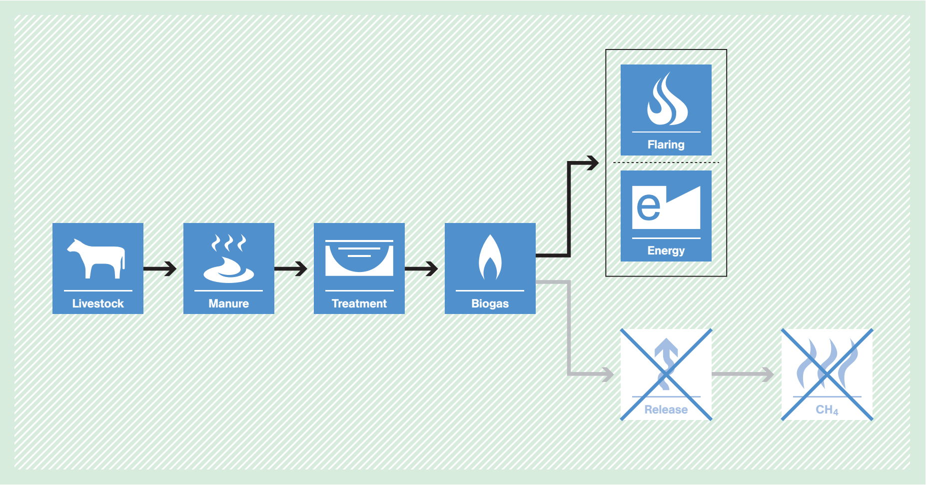
ACM0010 Consolidated baseline methodology for GHG emission reductions from manure management systems

Typical project(s)	Manure management on livestock farms (cattle, buffalo, swine, sheep, goats, and/or poultry) where the existing anaerobic manure treatment system is replaced by one or a combination of more than one animal waste management systems that result in less GHG emissions.
Type of GHG emissions mitigation action	• GHG destruction. Destruction of methane emissions and displacement of a more-GHG-intensive service.
Important conditions under which the methodology is applicable	• Farms where livestock populations are managed under confined conditions; • Farms where manure is not discharged into natural water resources (e.g. rivers or estuaries); • In case of anaerobic lagoon treatment systems, the depth of the lagoons used for manure management under the baseline scenario should be at least 1m; • The annual average temperature at the treatment site is higher than 5°C; • In the baseline case, the minimum retention time of manure waste in the anaerobic treatment system is greater than one month;
Important parameters	Monitored: • Number of heads of each population and the average animal weight in each population; • If dietary intake method is used, feed intake of animals and its energy has to be monitored; • Electricity and fossil fuel consumption.

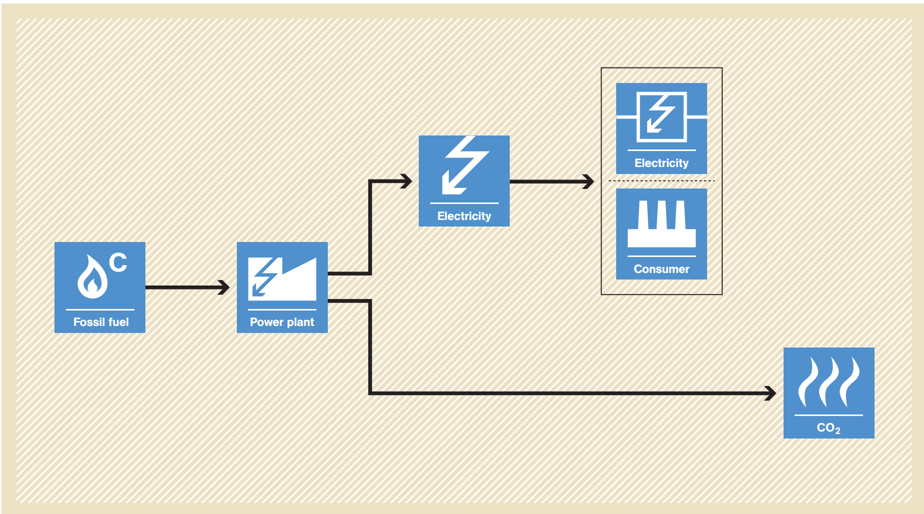
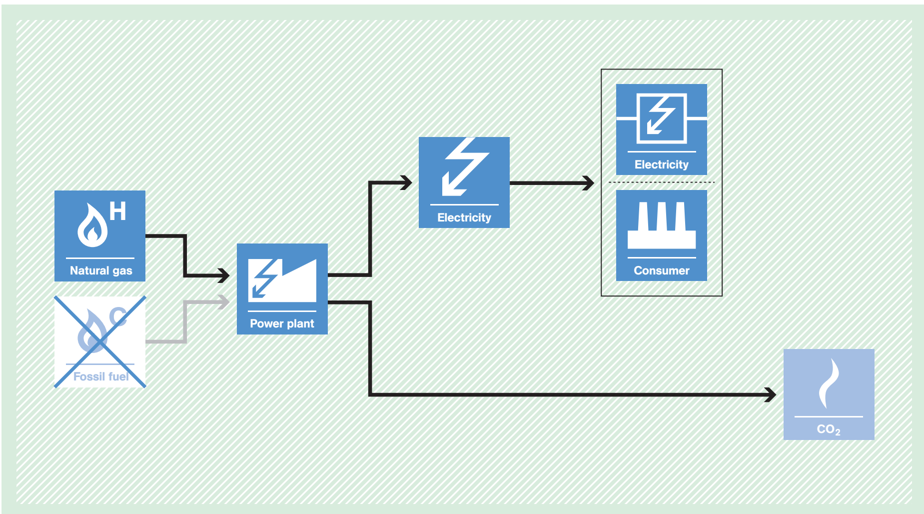
BASELINE SCENARIO
Existing manure management system results in release of methane into the atmosphere.



PROJECT SCENARIO
Capture of methane in the animal waste management systems results in less GHG emissions. In case of energetic use of methane, displacement of more-GHG-intensive energy generation.



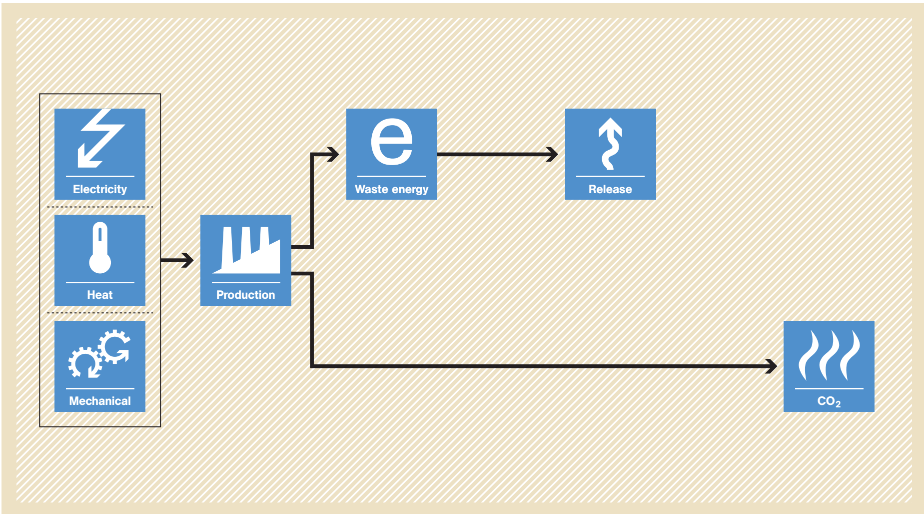
ACM0011 Consolidated baseline methodology for fuel switching from coal and/or petroleum fuels to natural gas in existing power plants for electricity generation

Typical project(s)	Switch from coal or petroleum derived fuel to natural gas at an existing power plant.
Type of GHG emissions mitigation action	• Fuel switch. Switch from coal or petroleum fuel to natural gas.
Important conditions under which the methodology is applicable	• At least three years of operation history are available; • The fuel switch is from only coal and/or petroleum fuels to only natural gas; • Only power is generated, for either only the grid or only a captive consumer; • The project does not involve major retrofits/modifications of the power plant.
Important parameters	At validation: • Historical fuel consumption and power generation; • Electricity emission factor (can also be monitored ex post).
	Monitored: • Quantity, calorific value and emission factor of fuels consumed in the project; • Electricity supplied to the electric power grid or consuming facility.
BASELINE SCENARIO Coal and/or petroleum fuel is used to generate electricity.	
PROJECT SCENARIO Natural gas is used to generate electricity.	

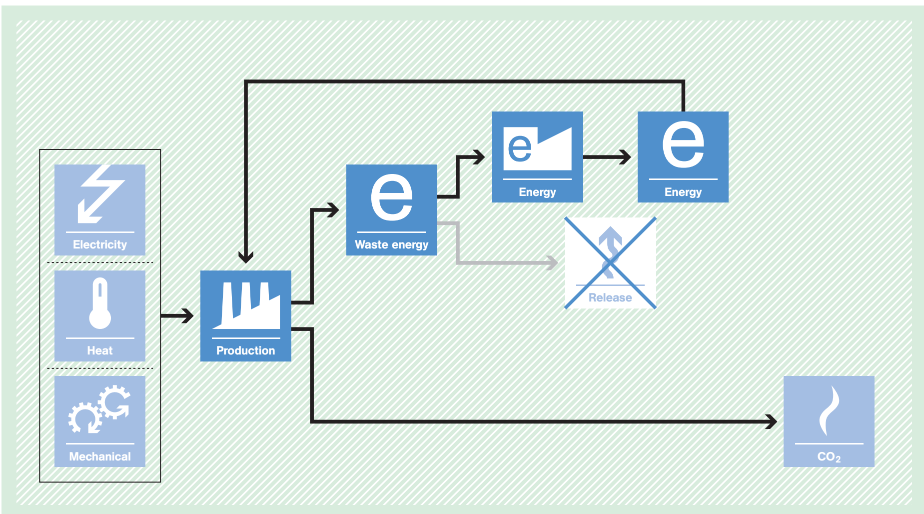
ACM0012 Consolidated baseline methodology for GHG emission reductions from waste energy recovery projects

Typical project(s)	Energy from waste heat, waste gas or waste pressure in an existing or new industrial facility is recovered and used for in-house consumption or for export, by installation of a new power and/or heat and/or mechanical energy generation equipment, or by installation of a more-efficient electricity generation equipment than already existing.
Type of GHG emissions mitigation action	• Energy efficiency Waste energy recovery in order to displace more-carbon-intensive energy/technology.
Important conditions under which the methodology is applicable	• In the absence of the project, all waste energy would be flared or released into the atmosphere. In case of partial use of the waste energy in the baseline situation, the project increases the share of used waste energy; • For capacity expansion projects, the new capacity should be treated as new facility and therefore the applicable guidance for baseline scenario determination, capping of baseline emissions and demonstration of use of waste energy in absence of the CDM project, should be followed; • An official agreement is required between the generating facility and the recipient facility of energy generated by project, in case they are different entities.
Important parameters	Monitored: • Quantity of electricity/ heat supplied to the recipient plant(s). • Quantity and parameters of waste energy streams during project.

BASELINE SCENARIO
Carbon-intensive sources will continue to supply heat/electricity/ mechanical energy to the applications of the recipient facility and unrecovered energy from waste energy source will continue to be wasted.



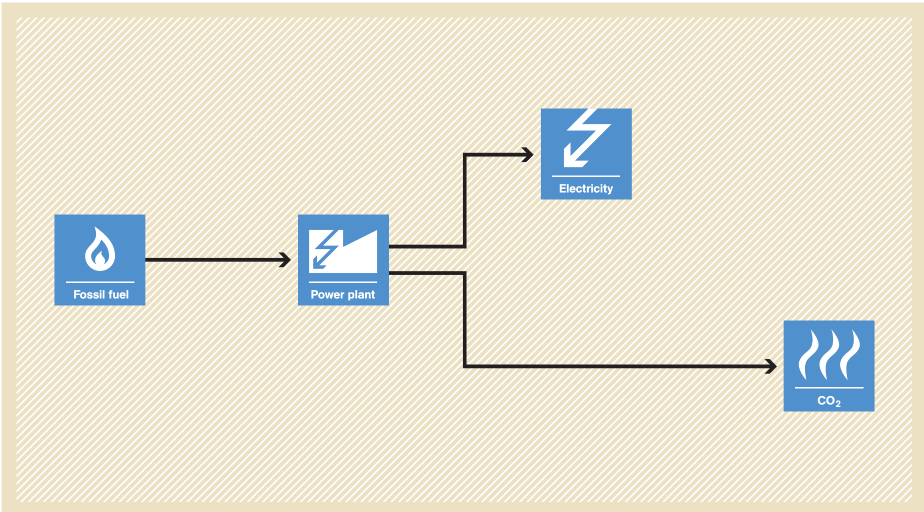
PROJECT SCENARIO
Heat/electricity/mechanical energy are generated by recovery of energy from a waste energy source and are supplied to the grid an/or applications in the recipient facility.



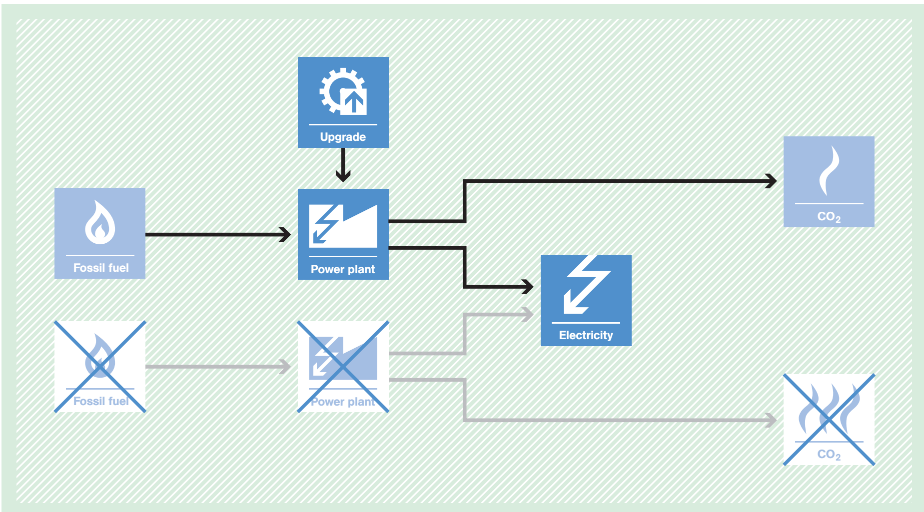
ACM0013 Consolidated baseline and monitoring methodology for new grid connected fossil fuel fired power plants using a less GHG intensive technology

Typical project(s)	Construction and operation of a new fossil fuel fired power plant that supplies electricity to the grid using more-efficient power generation technology than would otherwise be used with the given fossil fuel (e.g. construction of a supercritical coal fired power plant).
Type of GHG emissions mitigation action	• Energy efficiency. Construction of a highly efficient new grid-connected fossil-fuel-fired power plant.
Important conditions under which the methodology is applicable	• Only supply of power to the grid is applicable (no cogeneration); • The baseline fuel is used is used for more than 50% of the power generation in the geographical area.
Important parameters	At validation: • Energy efficiency of the power generation technology that has been identified as the most likely baseline scenario.
	Monitored: • Quantity, calorific value and emission factor of fuels consumed in the project; • Electricity supplied to the electric power grid.

BASELINE SCENARIO
Electricity is generated by a less-efficient new grid-connected power plant using fossil fuel.



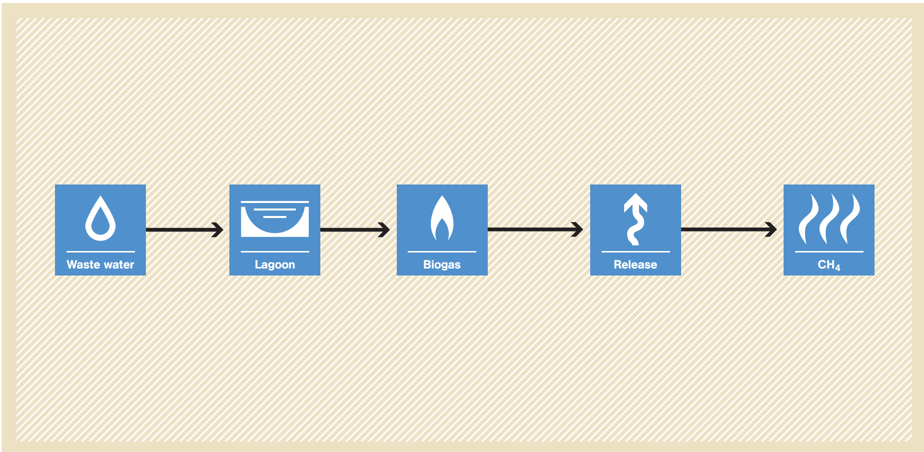
PROJECT SCENARIO
Electricity is generated by a more-efficient new grid-connected power plant using less fossil fuel.



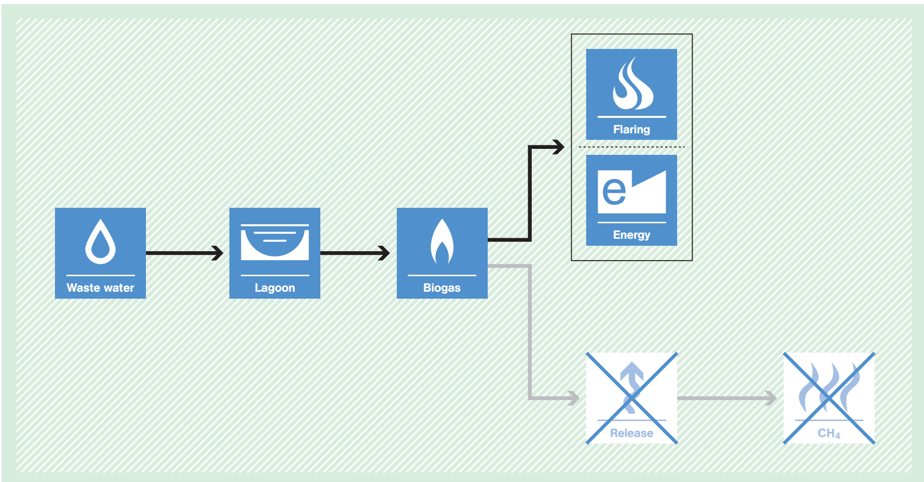
ACM0014 Mitigation of greenhouse gas emissions from treatment of industrial wastewater

Typical project(s)	Treatment of industrial wastewater in a new anaerobic digester, capture and flaring or utilizing of the generated biogas for electricity or heat generation; or treatment of industrial wastewater in the same treatment plant as in the baseline situation but treatment of the sludge from primary and/or secondary settler either in a new anaerobic digester or treatment of sludge under clearly aerobic conditions.
Type of GHG emissions mitigation action	• GHG destruction. Destruction of methane emissions and displacement of more-GHG-intensive service.
Important conditions under which the methodology is applicable	• The average depth of the open lagoons or sludge pits in the baseline scenario is at least one metre; • The residence time of the organic matter in the open lagoon system should be at least 30 days; • Local regulations do not prevent discharge of wastewater in open lagoons; • The sludge produced during the implementation of the project is not stored onsite before land application to avoid any possible methane emissions from anaerobic degradation.
Important parameters	Monitored: • Quantity and chemical oxygen demand (COD) of wastewater or sludge that is treated in the project; • Quantity of biogas collected and concentration of methane in the biogas; • Net quantity of electricity or heat generated in the project.

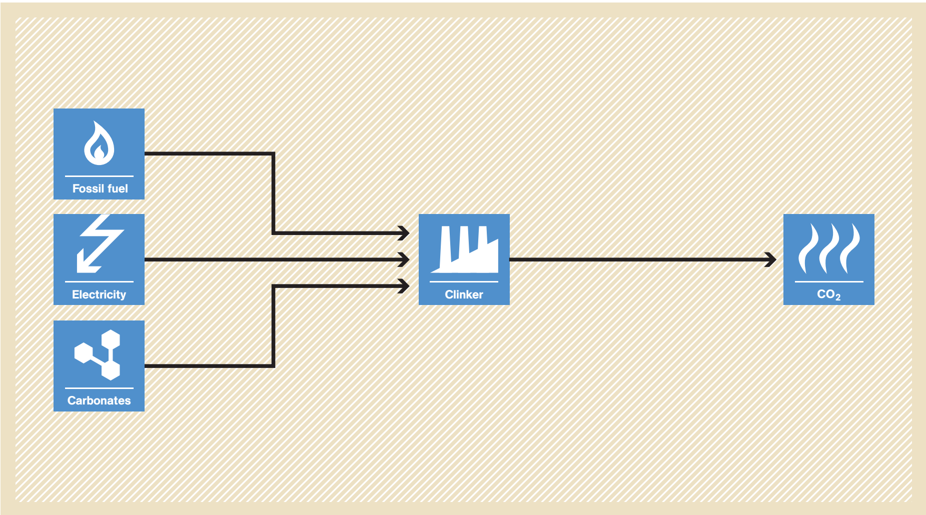
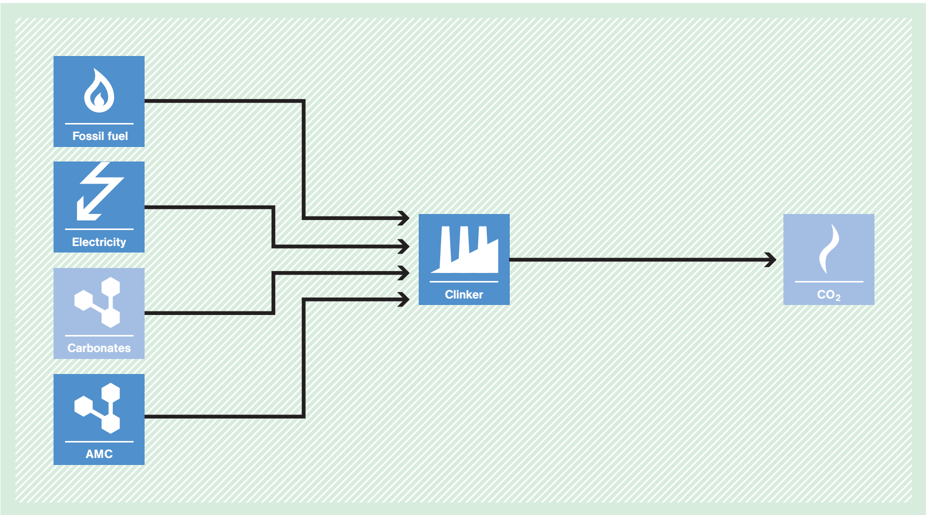
BASELINE SCENARIO
Existing wastewater treatment system results in release of methane into the atmosphere.



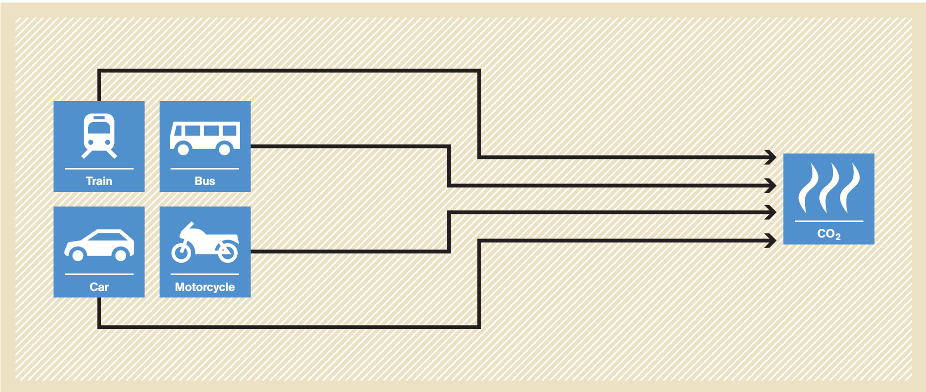
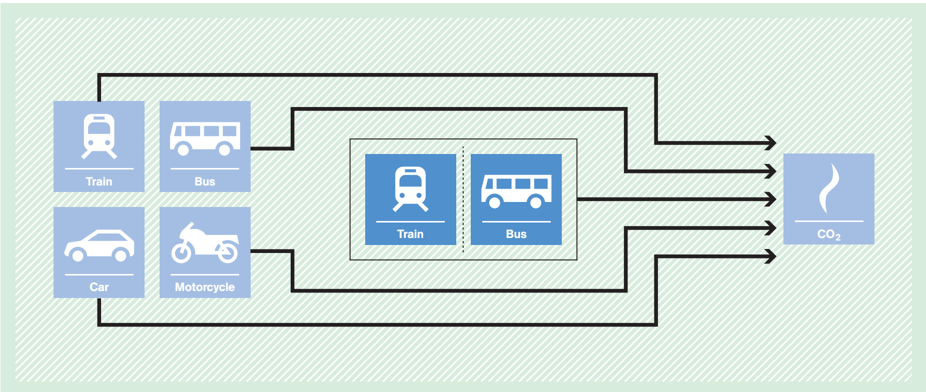
PROJECT SCENARIO
Capture of methane in the wastewater treatment system results in less GHG emissions. In case of energetic use of methane, displacement of more-GHG-intensive energy generation.



ACM0015 Consolidated baseline and monitoring methodology for project activities using alternative raw materials that do not contain carbonates for clinker production in cement kilns

Typical project(s)	Partial or full switch to alternative raw materials that do not contain carbonates (AMC) in the production of clinker in cement kilns.
Type of GHG emissions mitigation action	• Feedstock switch. Avoidance of process CO_2 emissions by switching to carbonate free feedstock in the production of clinker.
Important conditions under which the methodology is applicable	• Quality and types of clinker, energy efficiency and fuel used are not changed; • No AMC have previously been used in the clinker production at the plant; • At least 1.5 times the quantity of AMC required for meeting the demand of all existing users in the project area is available
Important parameters	At validation: • Historical raw material use and clinker production.
	Monitored: • Quantity of alternative materials consumed in the project; • Quantity of clinker produced in the project; • Specific Kiln Calorific Consumption; • Electricity consumption.
BASELINE SCENARIO Raw materials that contain calcium and/or magnesium carbonates (e.g. limestone) are used to produce clinker.	
PROJECT SCENARIO Alternative raw materials that do not contain carbonates (AMC) are used to produce clinker.	

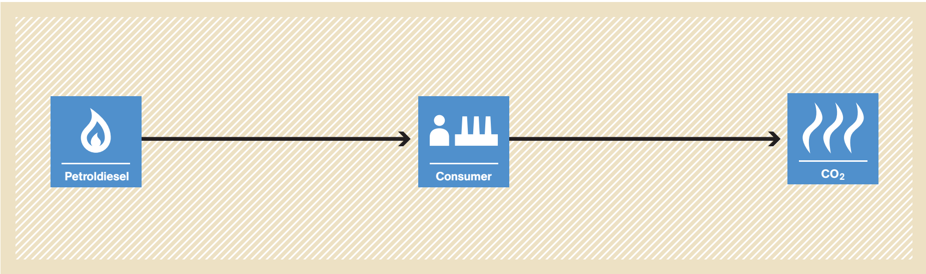
ACM0016 Baseline methodology for mass rapid transit projects

Typical project(s)	Establishment and operation of rail-based or bus-based mass rapid transit systems in urban or suburban regions for passenger transport by replacing a traditional urban bus-driven public transport system.
Type of GHG emissions mitigation action	• Energy efficiency. Displacement of more-GHG and, if gaseous fuels are used, CH_4-intensive transport modes (existing fleet of buses operating under mixed traffic conditions) by less-GHG-intensive ones (newly developed rail-based systems or segregated bus lanes).
Important conditions under which the methodology is applicable	• The project either installs new railways or segregated bus lanes in order to replace existing bus routes (e.g. by scrapping buses, closing or rescheduling bus routes). For bus rapid transit systems with feeder plus trunk routes, methodology AM0031 is recommended; • The methodology is applicable for urban or suburban trips. It is not applicable for inter-urban transport and it cannot be used in areas where currently no public transport is available; • The methodology is not applicable for operational improvements (e.g. new or larger buses) of an already existing and operating bus lane or rail-based system.
Important parameters	At validation: • An extensive survey with the passengers using the project is required in order to determine the baseline scenario (i.e. the distance and mode of transport that the passengers using the project would have used in the baseline).
	Monitored: • The number of passengers transported in the project; • Specific fuel consumption, occupancy rates and travelled distances of different transport modes as well as the speed of vehicles on affected roads.
BASELINE SCENARIO Passengers are transported using a diverse transport system involving buses, trains, cars, non-motorized transport modes, etc. operating under mixed traffic conditions.	
PROJECT SCENARIO Passengers are transported using newly developed rail-based systems or segregated bus lanes that partially displace the existing bus-driven transport system operated under mixed traffic conditions.	

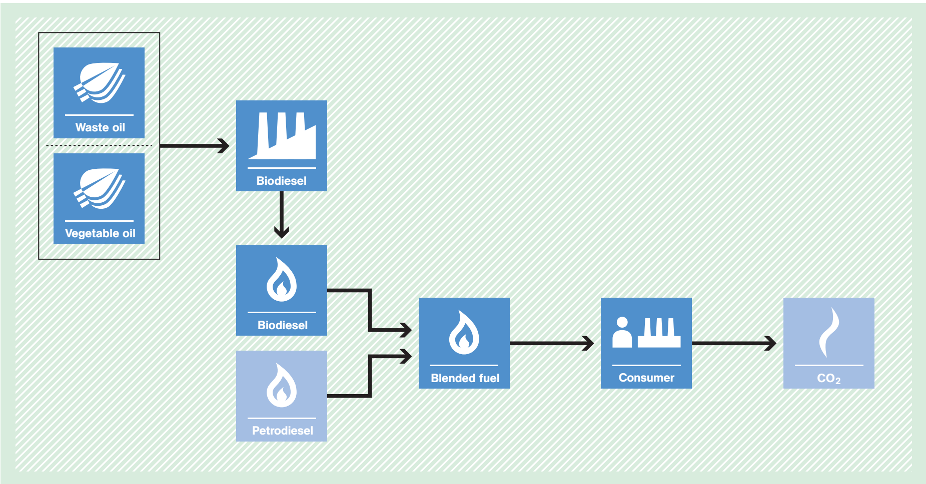
ACM0017 Production of biodiesel for use as fuel

Typical project(s)	Construction and operation of a biodiesel production plant for production of blended biodiesel that is used as fuel in existing stationary installations (e.g. diesel generators) and/or in vehicles. Biodiesel is produced from waste oil/fat and/or vegetable oil that is produced from oilseeds from plants that are cultivated on dedicated plantations established on lands that are degraded or degrading at the start of the project.
Type of GHG emissions mitigation action	• Renewable energy. Displacement of more-GHG-intensive fossil fuel for combustion in vehicles and/or stationary installations.
Important conditions under which the methodology is applicable	• The alcohol used for esterification (production of biodiesel) is methanol from fossil fuel origin; • No modifications in the consumer stationary installations or in the vehicles engines are necessary to consume/combust the (blended) biodiesel; • If applicable, the plantations are established on land classified as degraded or degrading or on a land area that is included in the project boundary of one or several registered A/R CDM project activities; • Consumer and producer of the (blended) biodiesel are bound by a contract that allows the producer to monitor consumption of (blended) biodiesel and that states that the consumer shall not claim CERs resulting from its consumption.
Important parameters	Monitored: • Quantity of biodiesel from waste oil/fat or feedstock from dedicated plantations consumed by host country consumers to substitute petrodiesel; • Project emissions from transport of oilseeds, biomass residues, vegetable oil, waste oil/fats, biodiesel if distances of more than 50 km are covered; fossil fuel (including methanol) and electricity consumption; • If applicable, parameters to monitor project emissions (CO_2, CH_4, N_2O) associated with the cultivation of oilseeds.

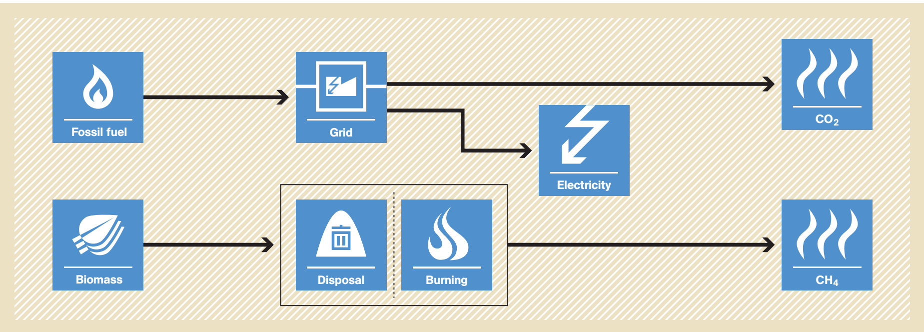
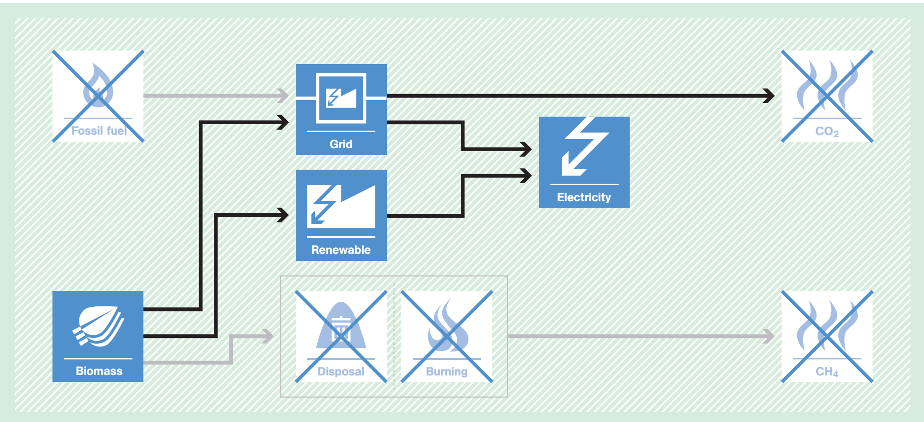
BASELINE SCENARIO
Consumption of petrodiesel.



PROJECT SCENARIO
Production of blended biodiesel and consumption in existing stationary installations (e.g. diesel generators) and/or in vehicles.



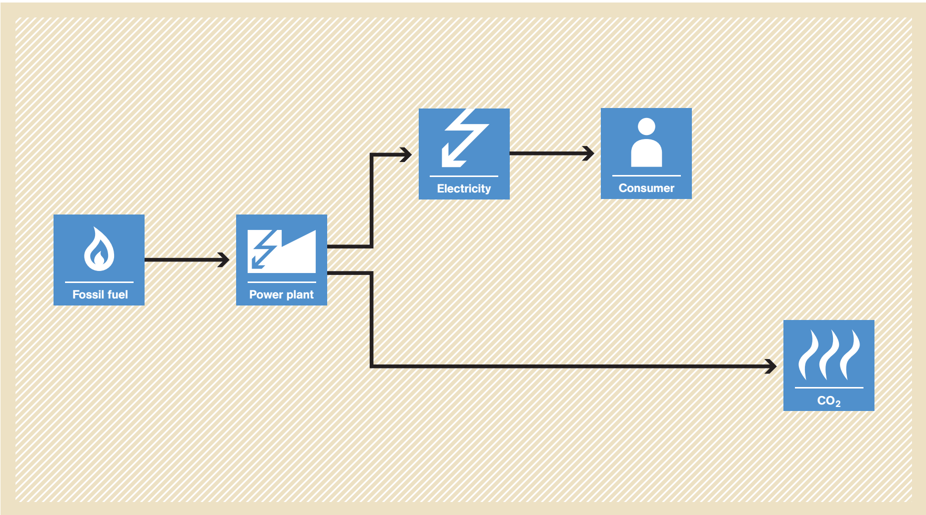
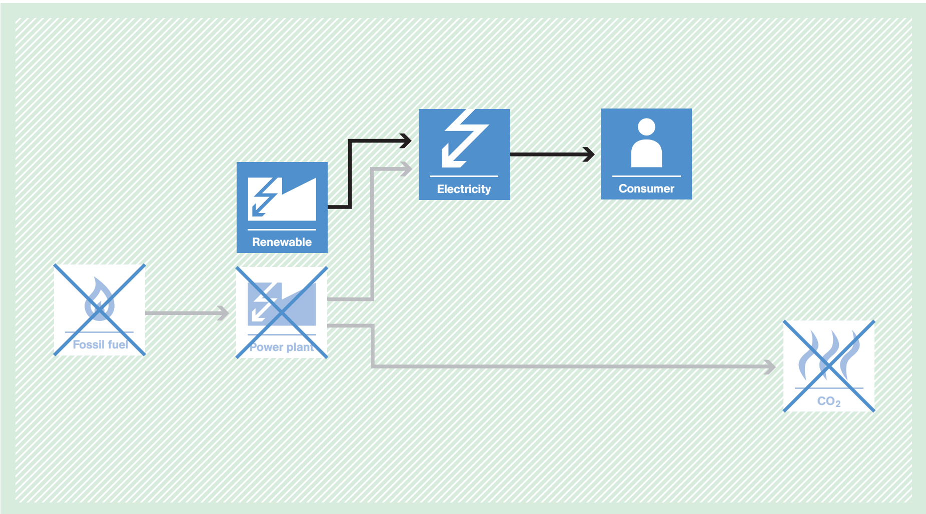
ACM0018 Consolidated methodology for electricity generation from biomass residues in power-only plants

Typical project(s)	Generation of power using biomass residues as fue, in new biomass based power plants at sites where currently no power generation occurs (greenfield), replacement or installation of operation units next to existing power plants (capacity expansion projects), energy efficiency improvement projects or replacement of fossil fuel by biomass residues in existing power plants (fuel switch projects).
Type of GHG emissions mitigation action	• Renewable energy; Displacement of more GHG-intensive electricity generation in the grid or on-site. Avoidance of methane emissions from anaerobic decay of biomass residues.
Important conditions under which the methodology is applicable	• The project may be based in an agro-industrial plant generating the biomass residues or be an independent plant supplied by the nearby area or market. If biomass from a production process is used, the implementation of the project shall not result in an increase of the processing capacity of raw input; • The methodology is applicable to power-only plants; • Only biomass residues, not biomass in general, are eligible. No significant energy quantities except from transportation or mechanical treatment of the biomass residues should be required to prepare the biomass residues; • Fossil fuels may be co-fired in the project plant. However, the amount of fossil fuels co-fired shall not exceed 50% of the total fuel fired on an energy basis; • In case of existing facilities, three years of historical data is required for the calculation of emissions reductions.
Important parameters	At validation: • If applicable: grid emission factor (can also be monitored ex post).
	Monitored: • Electricity generated in the project; • Quantity and moisture content of the biomass residues used in the project and electricity and fossil fuel consumption of the project.
BASELINE SCENARIO Electricity would be produced by more-carbon-intensive technologies based on fossil fuel or less efficient power plants. Biomass residues could partially decay under anaerobic conditions, resulting in methane emissions.	
PROJECT SCENARIO Use of biomass residues replaces fossil fuel use. Decay of biomass residues used as fuel is avoided.	

Chapter II

2.4. METHODOLOGIES FOR SMALL SCALE CDM PROJECT ACTIVITIES

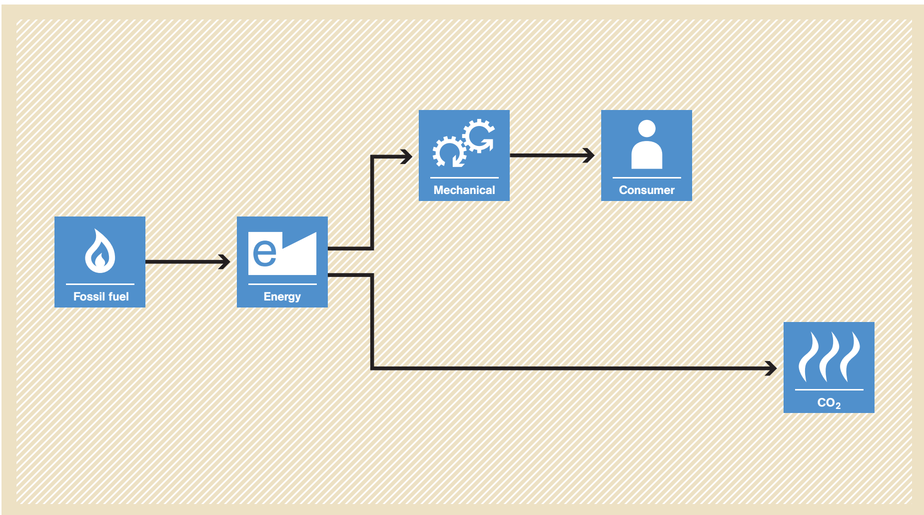
AMS-I.A. Electricity generation by the user

Typical project(s)	Renewable electricity generation such as solar, hydro, wind or biomass gasification are implemented by the users as new installations (greenfield) or replacement of existing onsite fossil-fuel-fired generation.
Type of GHG emissions mitigation action	• Renewable energy. Displacement of more-GHG-intensive service (e.g. refrigeration or lighting).
Important conditions under which the methodology is applicable	• Users are in off-grid locations, i.e. they do not have connection to a national/regional grid; • Users are included in the project boundary; • Conditions apply for reservoir-based hydro plants.
Important parameters	At validation: • Trend-adjusted projection of historical fuel consumption if an existing technology is replaced (for lighting, daily use duration can be applied).
	Monitored: • An annual check of all systems or a sample thereof to ensure that they are still operating, or metering of generated electricity; • If applicable, consumption of energy sources (e.g. biomass, fossil fuel).
BASELINE SCENARIO Services (e.g. lighting and refrigeration) are provided using fossil-fuel-based technologies (e.g. kerosene lamps and diesel generators).	
PROJECT SCENARIO Electricity is produced by users using renewable energy technologies (e.g. solar home systems for lighting, wind battery chargers for powering domestic appliances).	

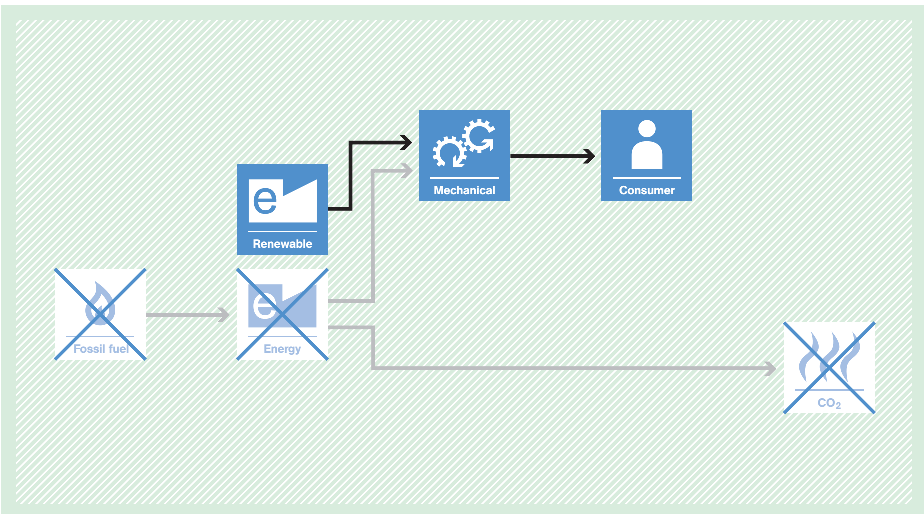
AMS-I.B. Mechanical energy for the user with or without electrical energy

Typical project(s)	Installation of renewable energy technologies such as hydropower, wind power and other technologies that provide mechanical energy that otherwise would have been supplied with fossil-fuel-based energy. Mechanical energy is used on-site by individual household(s) or user(s). Typical applications are wind-powered pumps, water mills and wind mills. The project may also produce electricity in addition to mechanical energy.
Type of GHG emissions mitigation action	• Renewable energy. Displacement of more-GHG-intensive fossil-fuel-based generation of mechanical power.
Important conditions under which the methodology is applicable	• Operating characteristics of the project system (e.g. head vs. discharge and efficiency of irrigation pump) should be similar to or better than the system being replaced or that would have been replaced.
Important parameters	Monitored: • An annual check of all systems or a sample thereof to ensure that they are still operating; • Annual hours of operation can be estimated from total output (e.g. tonnes of grain milled); • If applicable: quantity of each type of energy sources consumed (e.g. biomass, fossil fuel). Net calorific value and moisture content of biomass.

BASELINE SCENARIO
Mechanical energy would be produced using fossil-fuel-based technologies.



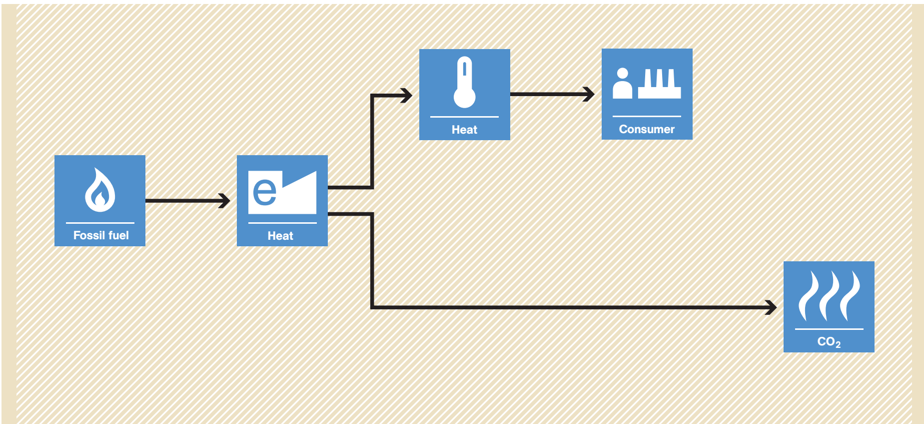
PROJECT SCENARIO
Mechanical energy is produced (with or without electricity) using renewable energy technologies.



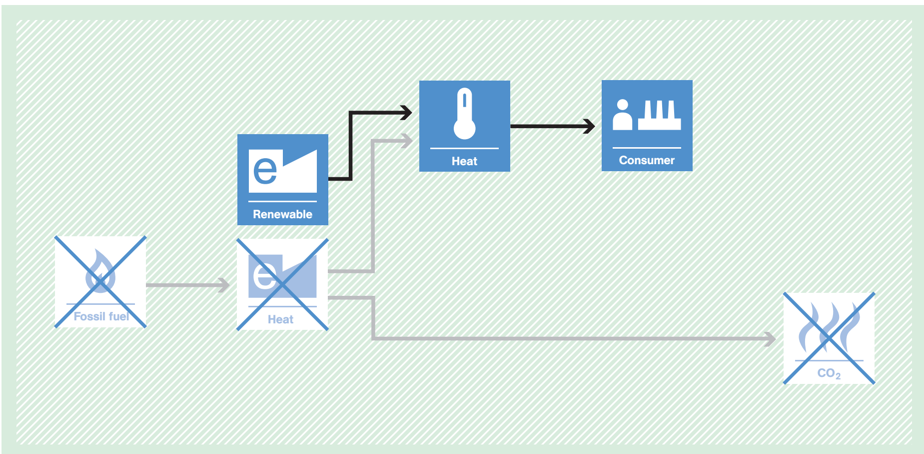
AMS-I.C. Thermal energy production with or without electricity

Typical project(s)	Thermal energy production using renewable energy sources including biomass-based cogeneration (heat/power). Projects that seek to retrofit or modify existing facilities for renewable energy generation are also applicable.
Type of GHG emissions mitigation action	• Renewable energy. Displacement of more-GHG-intensive thermal energy production, displacement of more-GHG-intensive heat and power generation.
Important conditions under which the methodology is applicable	• Energy production using biomass-based cogeneration systems is eligible. Electricity/heat is supplied to a captive use and/or to other facilities. Electricity can also be supplied to the grid; • If solid biomass is used, it has to be demonstrated that solely renewable biomass is used. If charcoal or biomass fuel is used, all project or leakage emissions (e.g. release of methane) from the fuel production have to be considered.
Important parameters	At validation: • In case of existing facilities, three years of historical data is required for the calculation of emissions reductions; • Grid emission factor (can also be monitored ex post).
	Monitored: • Thermal energy (mass flow, temperature, pressure for heat/cooling) delivered by the project and the amount of grid and/or captive electricity displaced; • Quantity of biomass and fossil fuel consumed as well as the moisture content and net calorific value of biomass consumed.

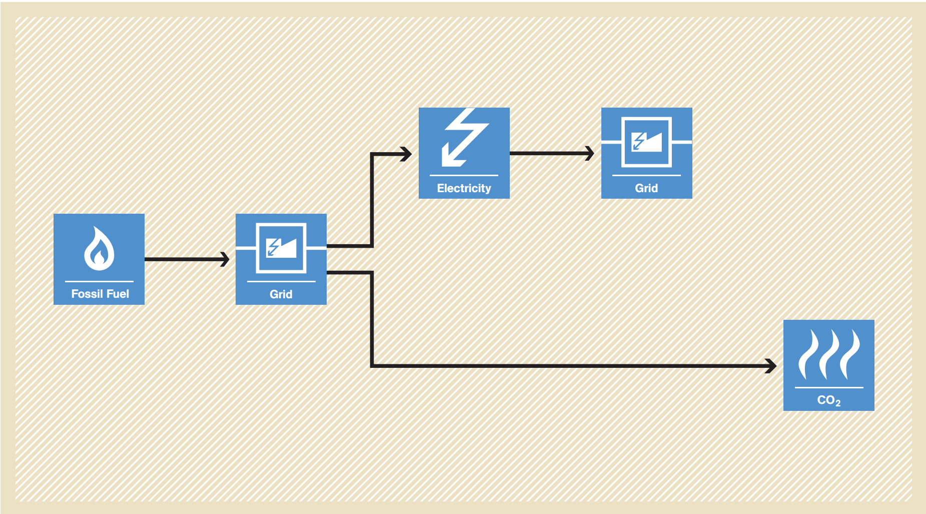
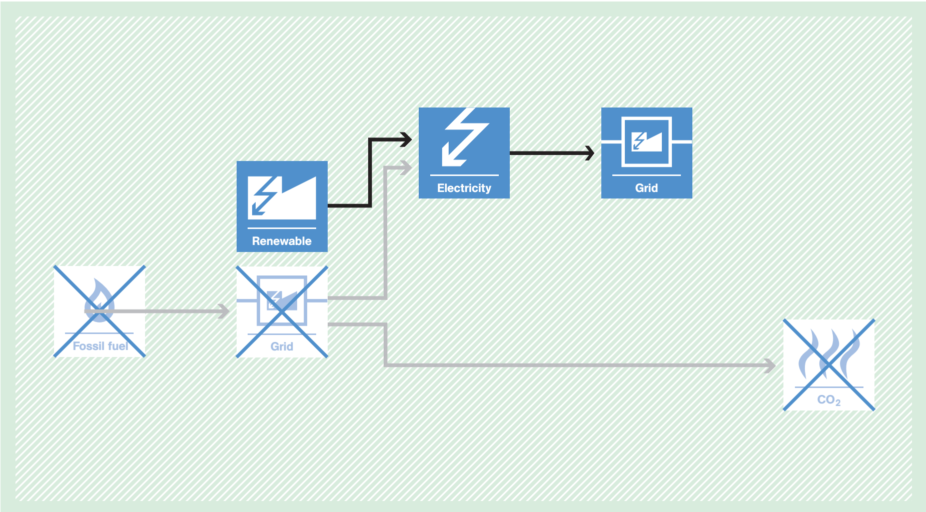
BASELINE SCENARIO
Energy production (heat or heat and power) by more-carbon-intensive technologies based on fossil fuel. In case of retrofits or capacity addition, operation of existing renewable power units without retrofit and capacity addition.



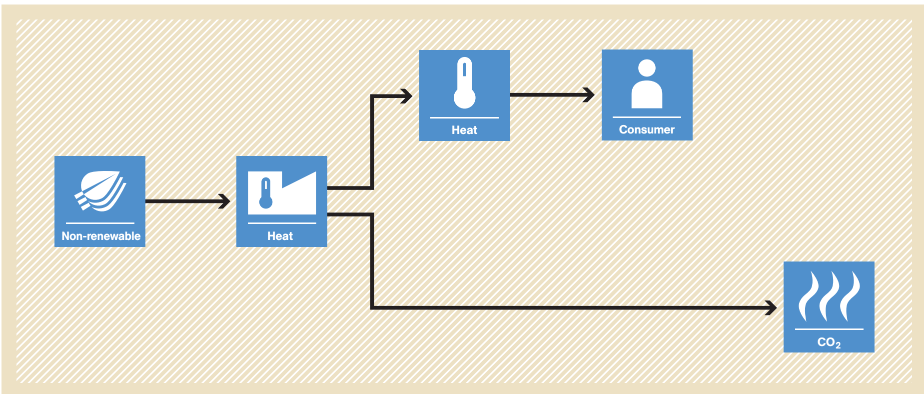
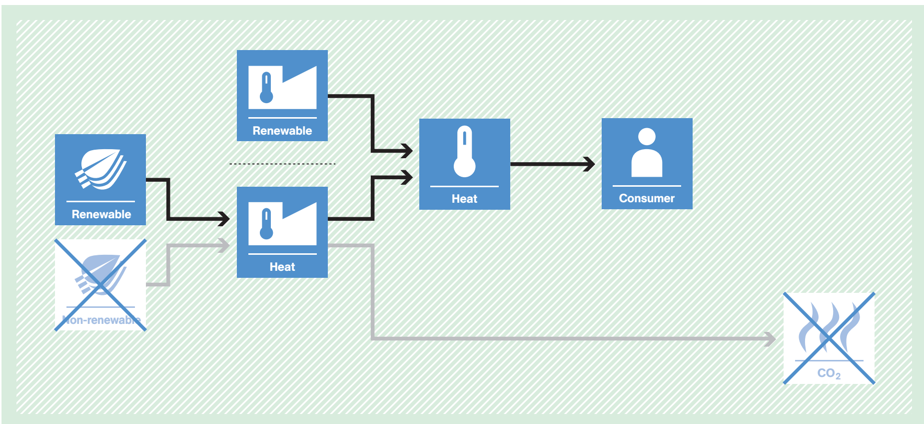
PROJECT SCENARIO
Energy generation by installation of new renewable energy generation units, by retrofitting or replacement of existing renewable energy generation units as well as by switch from fossil fuel to biomass in modified existing facilities.



AMS-I.D. Grid connected renewable electricity generation

Typical project(s)	Construction and operation of a power plant that uses renewable energy sources and supplies electricity to the grid (greenfield power plant) or retrofit, replacement or capacity addition of an existing power plant that uses renewable energy sources and supplies electricity to the grid.
Type of GHG emissions mitigation action	• Renewable energy. Displacement of electricity that would be provided to the grid by more-GHG-intensive means.
Important conditions under which the methodology is applicable	• Combined heat and power generation is not eligible (here, AMS I.C can be used); • Special conditions apply for reservoir-based hydro plants.
Important parameters	At validation: • Grid emission factor (can also be monitored ex post).
	Monitored: • Quantity of net electricity supplied to the grid; • Quantity of biomass/fossil fuel consumed. Net calorific value and moisture content of biomass.
BASELINE SCENARIO Electricity provided to the grid by more-GHG-intensive means.	
PROJECT SCENARIO Electricity is generated and supplied to the grid using renewable energy technologies.	

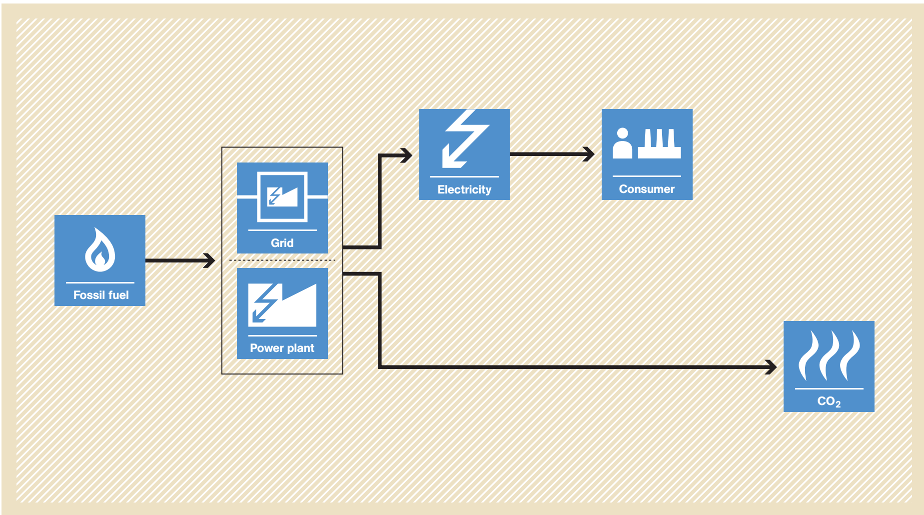
AMS-I.E. Switch from non-renewable biomass for thermal applications by the user

Typical project(s)	Generation of thermal energy by introducing renewable energy technologies for end-users that displace the use of non-renewable biomass. Examples of these technologies include but are not limited to biogas stoves, solar cookers or passive solar homes and safe drinking water applications.
Type of GHG emissions mitigation action	• Renewable energy; Displacement of more-GHG-intensive, non-renewable biomass-fuelled applications by introducing renewable energy technologies.
Important conditions under which the methodology is applicable	• It shall be demonstrated that non-renewable biomass has been used since December 31, 1989, and be ensured that the proposed project is not replacing the non-renewable biomass accounted for by already registered CDM projects in the same region; • Project appliances are continuously operated or replaced by equivalent service appliances; • Project participants shall determine the share of renewable and non-renewable woody biomass in the quantity of woody biomass used in the absence of the project.
Important parameters	Monitored: • Annual check of efficiency of the project appliances (e.g. by representative sample) and monitoring of the quantity of renewable biomass used by the project; • Leakage: The amount of woody biomass saved under the project that is used by non-project households/users (who previously used renewable energy sources) shall be assessed from surveys. • If applicable: Volume of drinking water per person and day using survey methods and compliance of the water quality with relevant national or international (WHO, US-EPA) microbiological water quality guidelines/standards.
BASELINE SCENARIO Thermal energy would be produced by more-GHG-intensive means based on the use of non-renewable biomass.	
PROJECT SCENARIO Use of renewable energy technologies for thermal energy generation, displacing non-renewable biomass use.	

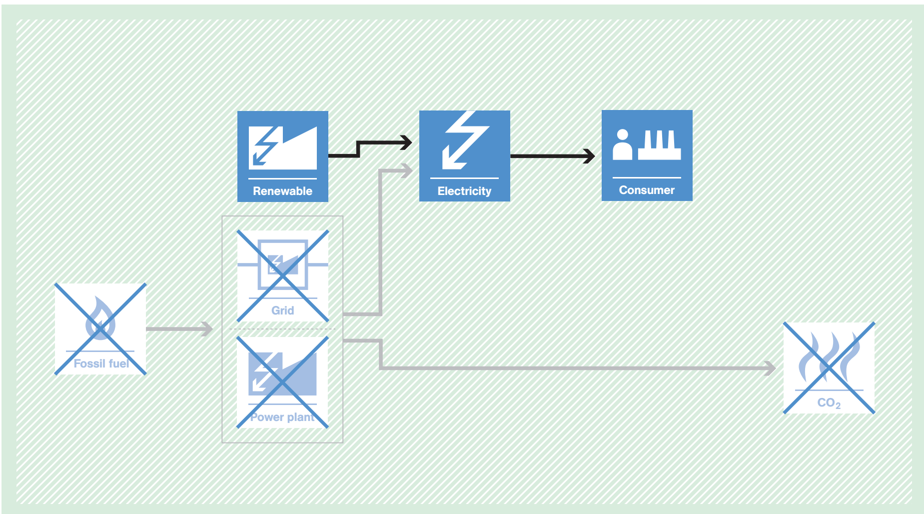
AMS-I.F. Renewable electricity generation for captive use and mini-grid

Typical project(s)	Production of electricity using renewable energy technologies such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass that supply electricity to user(s).
Type of GHG emissions mitigation action	• Renewable energy. Displacement of electricity that would be provided to the user(s) by more-GHG-intensive means.
Important conditions under which the methodology is applicable	• The project will displace electricity from an electricity distribution system that is or would have been supplied by at least one fossil fuel fired generating unit; • Electricity is produced by installing a new power plant (greenfield) or by capacity addition/retrofit/replacement of (an) existing plant(s); • Special conditions apply for reservoir-based hydro plants; • Cogeneration projects are not eligible.
Important parameters	At validation: • If applicable: grid emission factor (can also be monitored ex post). Monitored: • Net electricity generation, quantity of fossil fuel and biomass consumption.

BASELINE SCENARIO
Electricity would have been supplied by one or more energy sources such as a national or a regional grid or a fossil-fuel-fired captive power plant or a carbon-intensive mini-grid.



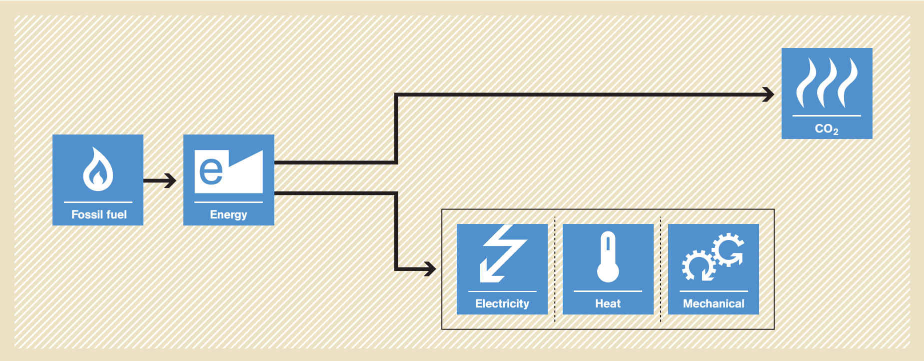
PROJECT SCENARIO
Electricity is supplied using renewable energy technologies.



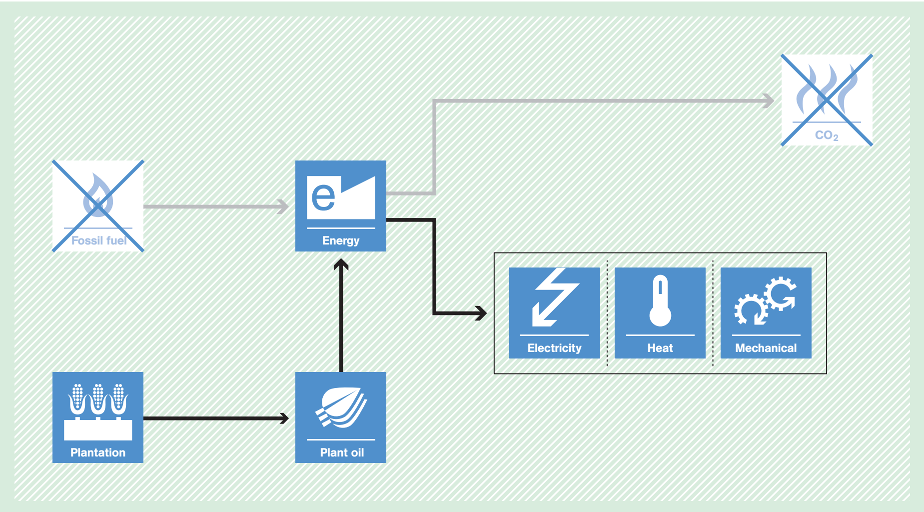
AMS-I.G. Plant oil production and use for energy generation in stationary applications

Typical project(s)	Plant oil production that is used for generation of thermal, mechanical and electrical energy in stationary equipment including cogeneration. The plant oil is produced from pressed and filtered oilseeds from plants that are cultivated on dedicated plantations.
Type of GHG emissions mitigation action	• Renewable energy. Displacement of more-GHG-intensive fossil fuel for combustion in stationary installations.
Important conditions under which the methodology is applicable	• The pure plant oil and its blends above 10% is used in specially built or modified equipment; • Export of produced plant oil is not allowed; • Oil crops are cultivated on area which is not a forest and has not been deforested during the last 10 years prior to the implementation of the project. Plantations established on peatlands are not eligible
Important parameters	Monitored: • Energy consumption of the combustion processes (e.g. plant oil, fossil fuel); • Parameters to estimate project emissions from the cultivation of oil crops if the default values for jatropha and palm oil are not applied; • If applicable: leakage emissions due to a shift of pre-project activities and the competing uses of biomass; • Quantity of the electricity produced; of the thermal energy (mass flow, temperature, pressure for heat/cooling) generated by the project; • Project emissions from fossil fuel and electricity consumption as well as from the transport of oilseeds if distances of more than 200 km are covered.

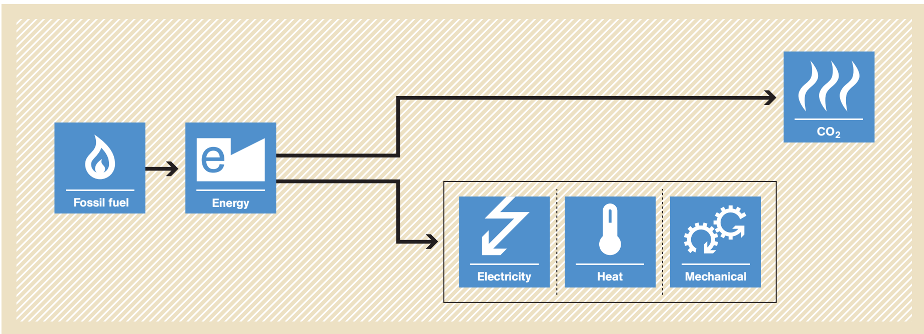
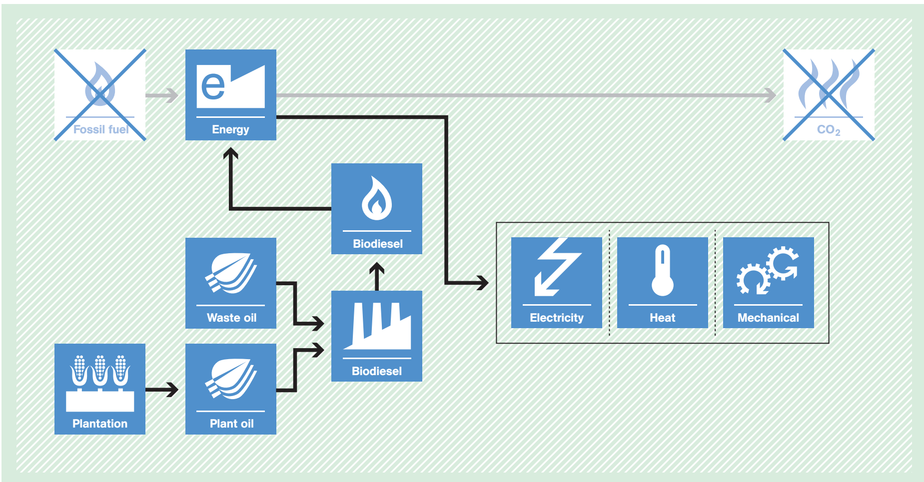
BASELINE SCENARIO
Services (e.g. electricity, thermal and mechanical energy supply) are provided using fossil-fuel-based technologies



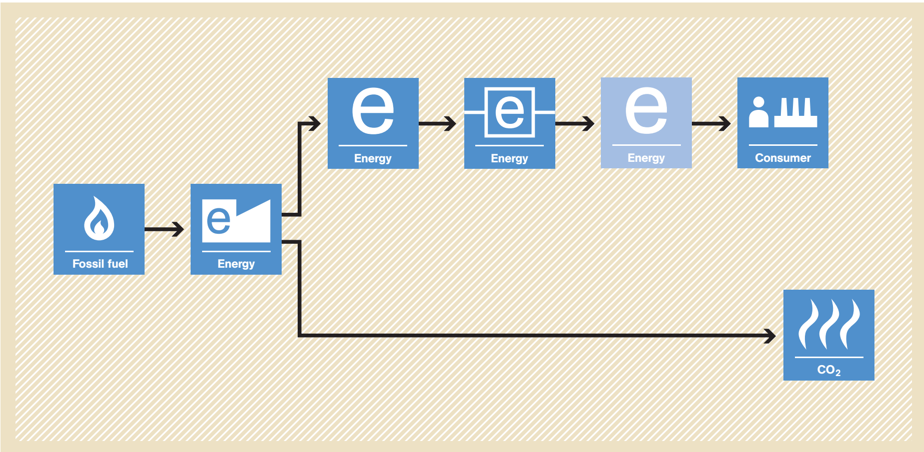
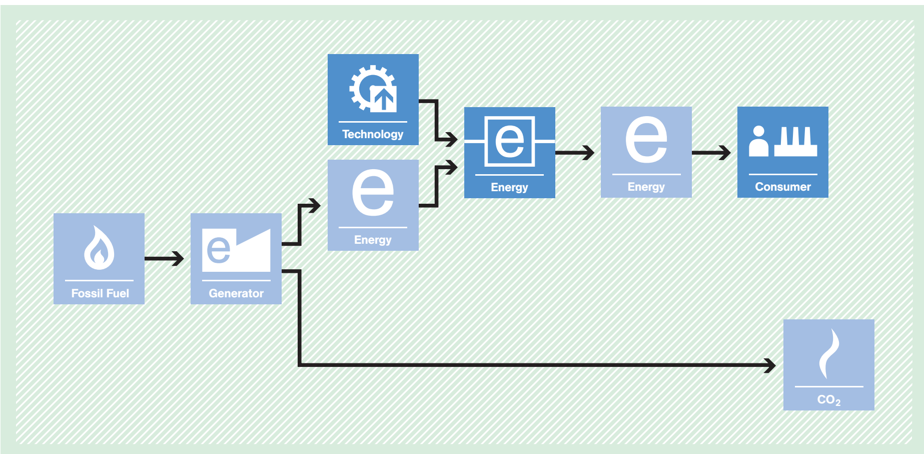
PROJECT SCENARIO
Oil crops are cultivated, plant oil is produced and used for the generation of electricity, thermal or mechanical energy displacing fossil fuel.



AMS-I.H. Biodiesel production and use for energy generation in stationary applications

Typical project(s)	Biodiesel is produced from oilseeds cultivated on dedicated plantations and from waste oil/fat and used to generate thermal; mechanical or electrical energy in equipment including cogeneration.
Type of GHG emissions mitigation action	• Renewable energy. Displacement of more-GHG-intensive fossil fuel for combustion in stationary installations.
Important conditions under which the methodology is applicable	• The pure biodiesel and its blends above 10% is used in specially built or modified equipment; • The alcohol used for esterification is methanol from fossil fuel origin; • Export of produced biodiesel is not allowed; • Oil crops are cultivated on area which is classified as degraded or degrading as per the “Tool for the identification of degraded or degrading lands for consideration in implementing CDM A/R project” or on area included in the project boundary of one or several registered A/R CDM project activities. Plantations established on peatlands are not eligible.
Important parameters	Monitored: • Energy consumption of the combustion processes (e.g. biodiesel, fossil fuel); • Parameters to estimate project emissions from the cultivation of oil crops if the default values for jatropha and palm oil are not applied; • If applicable: Leakage emissions due to a shift of pre-project activities and the competing uses of biomass; • Quantity of the electricity produced; of the thermal energy (mass flow, temperature, pressure for heat/cooling) generated by the project; • Project emissions from fossil fuel and electricity consumption as well as from the transport of oilseeds if distances of more than 200 km are covered.
BASELINE SCENARIO Services (e.g. electricity, thermal and mechanical energy supply) are provided using fossil fuel based technologies.	
PROJECT SCENARIO Biodiesel is produced from cultivated oil crops or from waste oil/fat and used for the generation of electricity, thermal or mechanical energy displacing fossil fuel.	

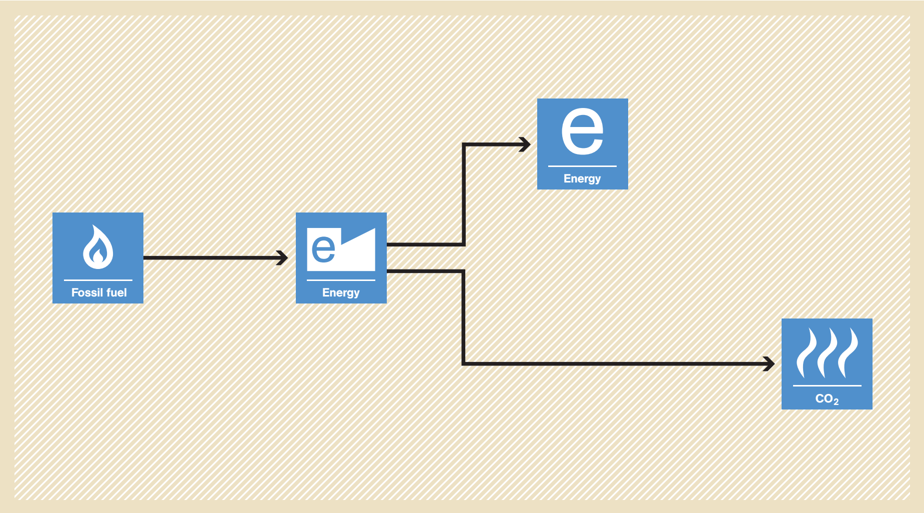
AMS-II.A. Supply side energy efficiency improvements – transmission and distribution

Typical project(s)	Technical energy losses are reduced through energy efficiency measures such as upgrading the voltage on a transmission/distribution system, replacing existing transformers with more efficient transformers (e.g. replacement of a silicon steel core transformer with an amorphous metal transformer) in electrical transmission/distribution system or improving pipe insulation in a district heating system. The project may be the upgrade/replacement of an existing distribution system or be part of an expansion of an existing system.
Type of GHG emissions mitigation action	• Energy efficiency. Technology with higher efficiency reduces electrical or thermal energy losses and thereby GHG emissions.
Important conditions under which the methodology is applicable	• Measures that reduce technical losses solely by improving operations and/or maintenance practices are not eligible; • Introduction of capacitor banks and tap changing transformers for reducing losses in an electricity distribution is not covered; • For retrofit projects, historical data is required to determine technical losses of the existing equipment.
Important parameters	Monitored: • Technical energy losses of the project equipment; • If applicable: for radial electricity distribution systems for which no performance-measuring standards are available, technical losses shall be determined by a peer reviewed method.
BASELINE SCENARIO Electrical/thermal energy is transmitted and distributed using less-efficient energy system.	
PROJECT SCENARIO Reducing technical losses and thereby GHG emissions through installation of a new energy-efficient distribution/transmission equipment/system and/or retrofit of the existing less-efficient equipment/system.	

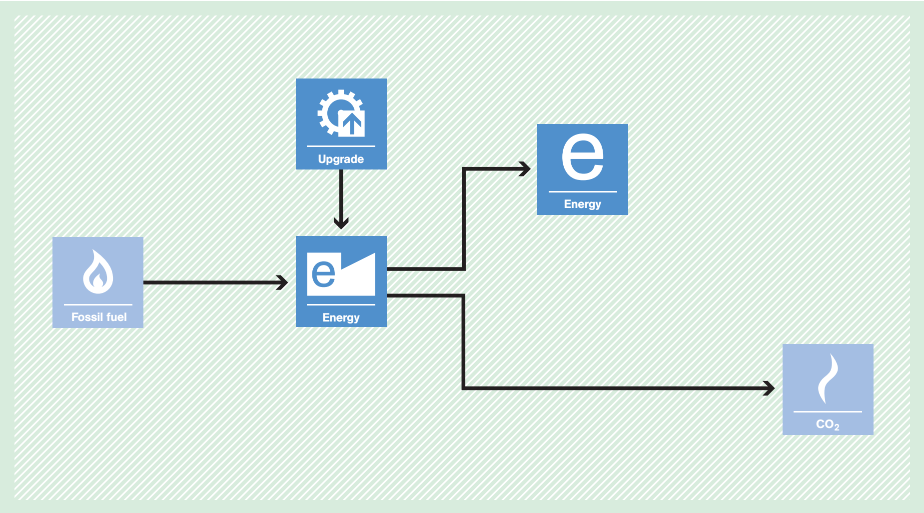
AMS-II.B. Supply side energy efficiency improvements – generation

Typical project(s)	Introduction of more-efficient electricity and/or thermal energy generation units or complete replacement of existing power stations, district heating plants and cogeneration units by new equipment with a higher efficiency or retrofitting of existing fossil-fuel-fired generating units in order to increase their efficiency.
Type of GHG emissions mitigation action	• Energy efficiency. Technology with higher efficiency reduces fossil fuel consumption for energy generation and thereby reduces GHG emissions.
Important conditions under which the methodology is applicable	• Baseline and project technologies utilize fossil fuels to produce energy; • Renewable energy projects are not applicable (type I methodologies e.g. AMS-I.C. or AMS-I.D. may be explored.).
Important parameters	Monitored: • Quantity of fuel used in the energy generating equipment; • Quantity of energy output.

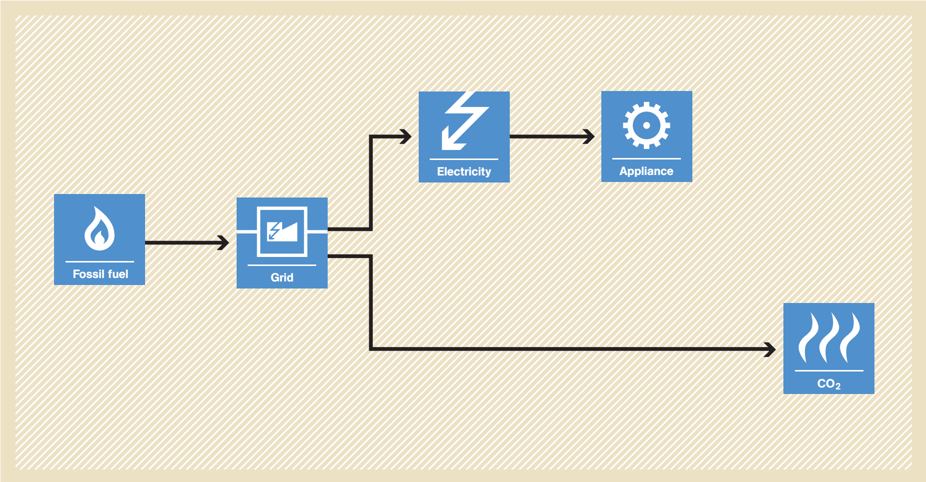
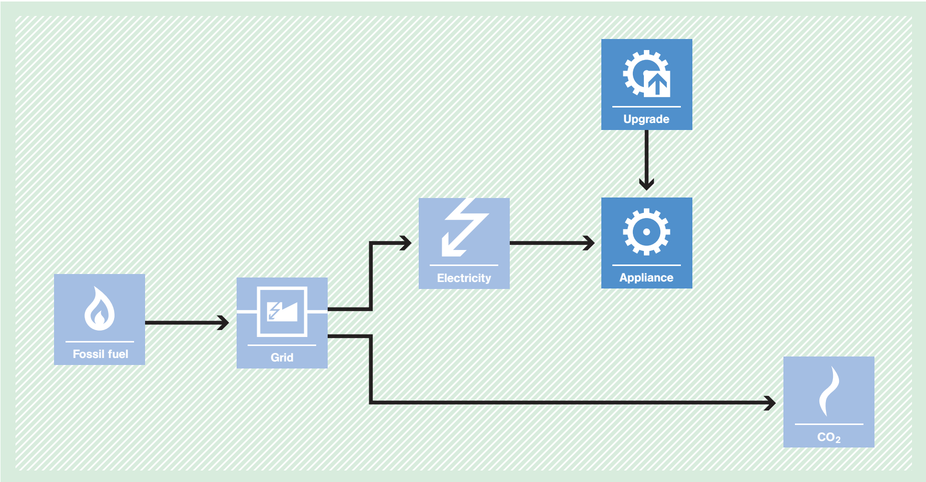
BASELINE SCENARIO
Continuation of the current situation; i.e. use of the existing fossil-fuel-fired energy generation equipment with lower efficiency.



PROJECT SCENARIO
Installation of more-efficient energy generation technology and/or complete replacement of existing less-efficient equipment and/or retrofitting of an existing energy generation system reduces fossil fuel consumption and GHG emissions.



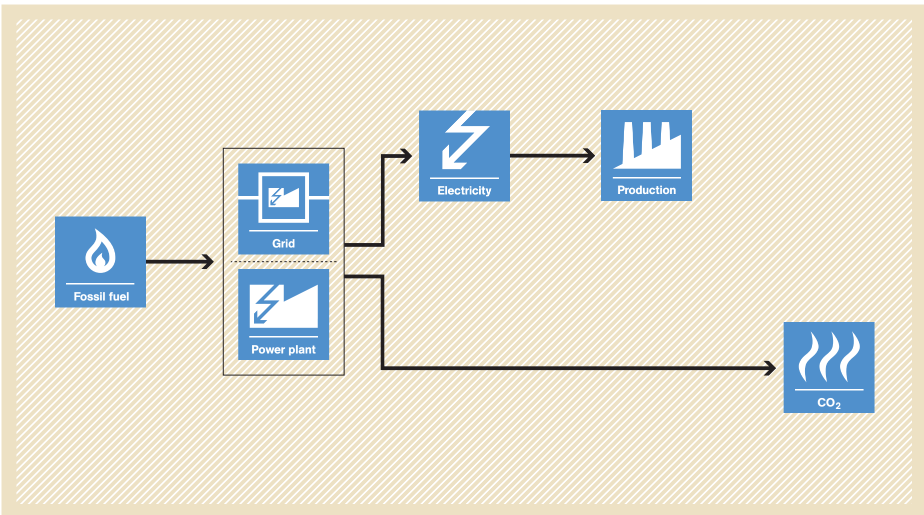
AMS-II.C. Demand-side energy efficiency activities for specific technologies

Typical project(s)	Demand side energy efficiency activities, e.g. adoption of efficient lamps, ballasts, refrigerators, motors, fans, air conditioners, pumping systems at many sites. Technologies may replace existing equipment or be installed at new sites (greenfield).
Type of GHG emissions mitigation action	• Energy efficiency. Displacement of more-GHG-intensive service by use of more-efficient technology.
Important conditions under which the methodology is applicable	• Rated capacity or output or level of service (e.g. light output, water output, room temperature and comfort, the rated output capacity of air conditioners, etc.) is not significantly smaller (maximum -10%) than the baseline or significantly larger (maximum + 50%) than the baseline; • If applicable: refrigerant used in the project shall be CFC-free.
Important parameters	At validation: • If applicable: grid emission factor (can also be monitored ex post).
	Monitored: • Monitoring shall include annual checks of a sample of non-metered systems to ensure that they are still operating; • Recording the "power" of the device installed and metering a sample of the units installed for their operating hours using run time meters; or metering the "energy use" of an appropriate sample of the devices installed.
BASELINE SCENARIO Less-efficient equipment/ appliance (e.g. lamps, refrigerators, motors, fans, air conditioners, pumping systems) consume more energy, thus resulting in higher GHG emissions.	
PROJECT SCENARIO More-efficient equipment/ appliance (e.g. lamps, refrigerators, motors, fans, air conditioners, pumping systems) consume less energy, thus resulting in lower GHG emissions.	

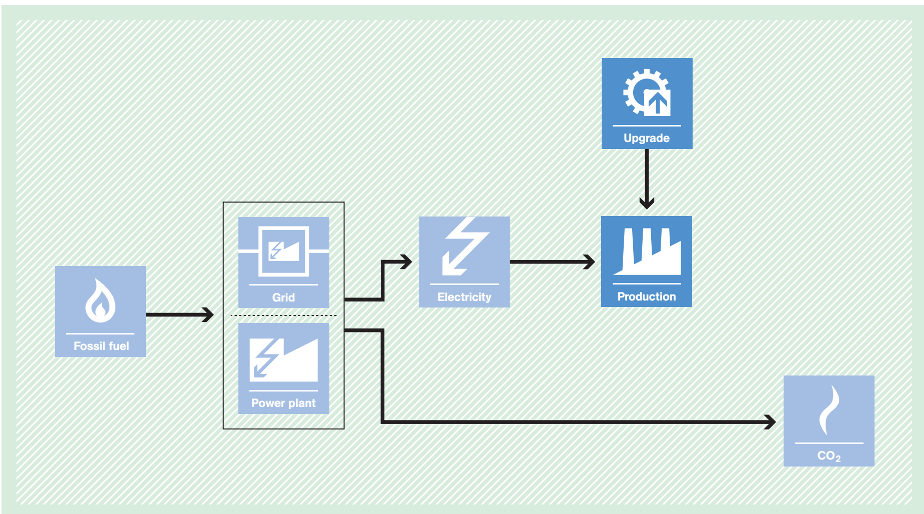
AMS-II.D. Energy efficiency and fuel switching measures for industrial facilities

Typical project(s)	Energy efficiency measures such as efficient motors, pumps, boilers, power generation, etc., for specific industrial or mining and mineral production processes (such as steel furnaces, paper drying, tobacco curing, etc.) through new installation or retrofit/ replacements.
Type of GHG emissions mitigation action	• Energy efficiency. Increase in energy efficiency with, optionally, a switch to less-carbon-intensive fuel.
Important conditions under which the methodology is applicable	• The main activity is related to energy efficiency enhancement and not to fuel switch; • Energy use within the project boundary can be directly measured; • Improvements in efficiency by the project can be clearly distinguished from efficiency changes/improvements not attributed to the project.
Important parameters	At validation: • Energy consumption and emission intensity of energy types in the baseline.
	Monitored: • Specification of equipment (installed, retrofitted); • Metering the energy use of equipments; • Output.

BASELINE SCENARIO
Consumption of electricity and/or fossil fuel leads to CO_2 emissions.



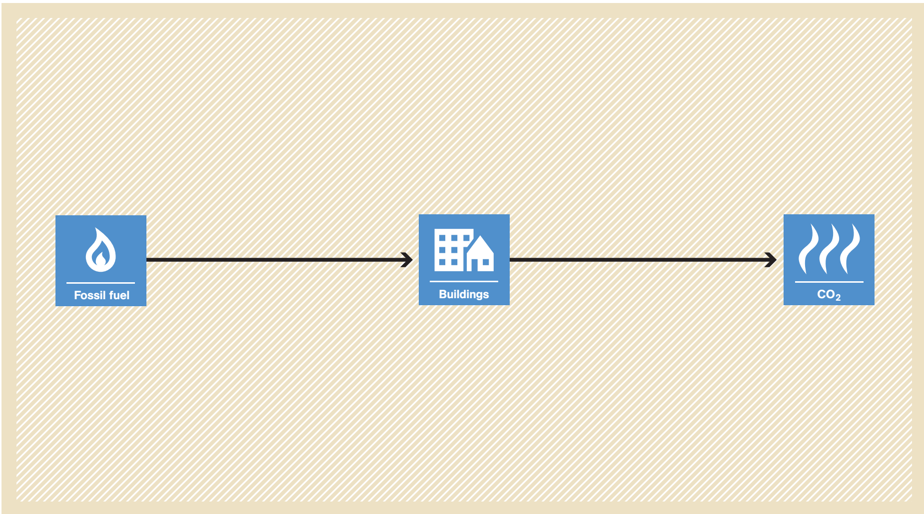
PROJECT SCENARIO
Consumption of less electricity and/or fossil fuel leads to decreased CO_2 emissions.



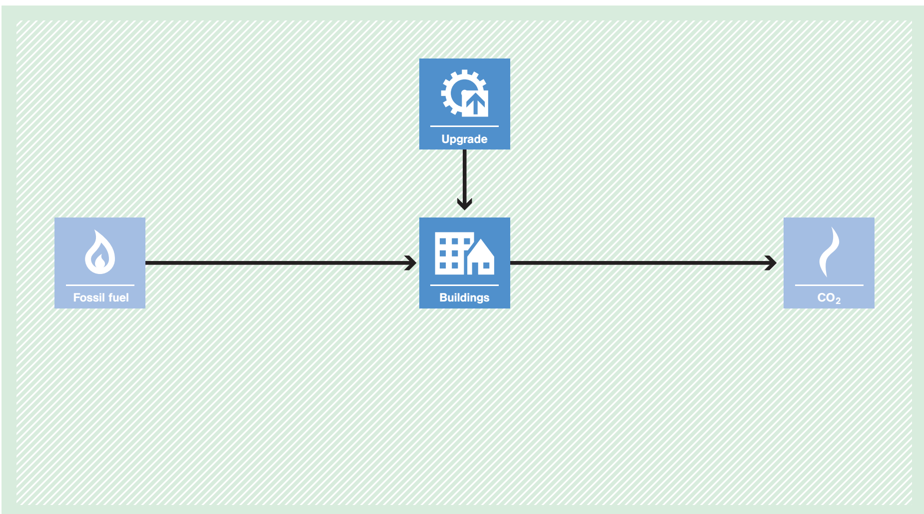
AMS-II.E. Energy efficiency and fuel switching measures for buildings

Typical project(s)	Installation of, or replacement or retrofit of, existing equipment with energy efficiency (e.g. efficient appliances, better insulation) and optional fuel switching (e.g. switch from oil to gas) measures in residential, commercial or institutional buildings.
Type of GHG emissions mitigation action	• Energy efficiency; Electricity and/or fuel savings through energy efficiency improvement. Optionally, use of less-carbon-intensive fuel.
Important conditions under which the methodology is applicable	• Energy use within the project boundary shall be directly measured; • The impact of the implemented measures (improvements in energy efficiency) can be clearly distinguished from changes in energy use due to other variables not influenced by the project.
Important parameters	At validation: • Energy use of buildings before the project implementation. • If grid electricity is consumed: grid emission factor (can also be monitored ex post).
	Monitored: • Specifications of the equipment replaced or retrofitted (only for replacement or retrofit projects); • Energy use of buildings after the project implementation.

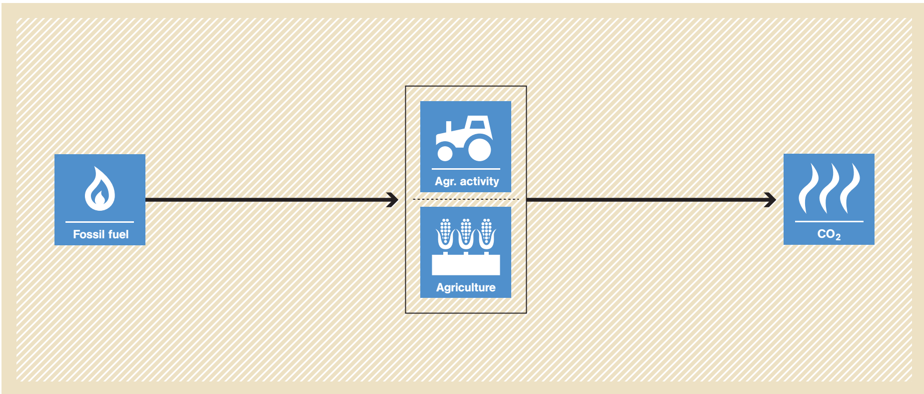
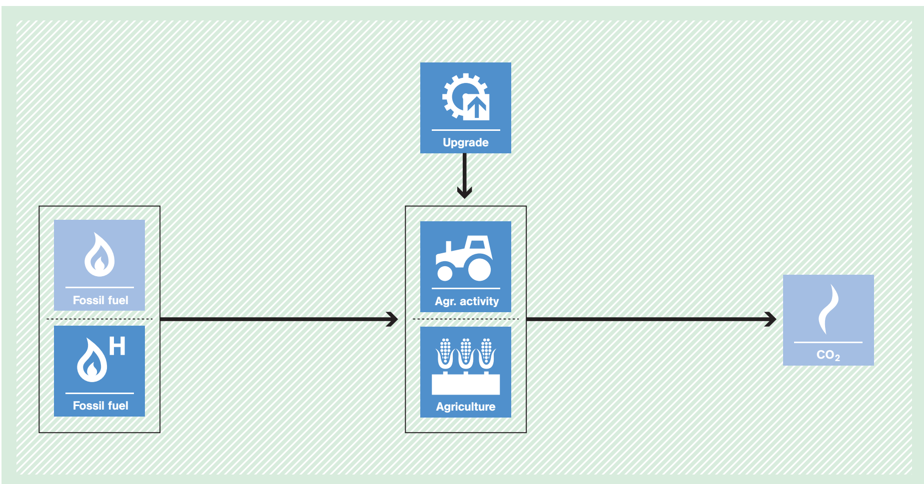
BASELINE SCENARIO
Use of less-efficient and/or more-carbon-intensive equipment in buildings.



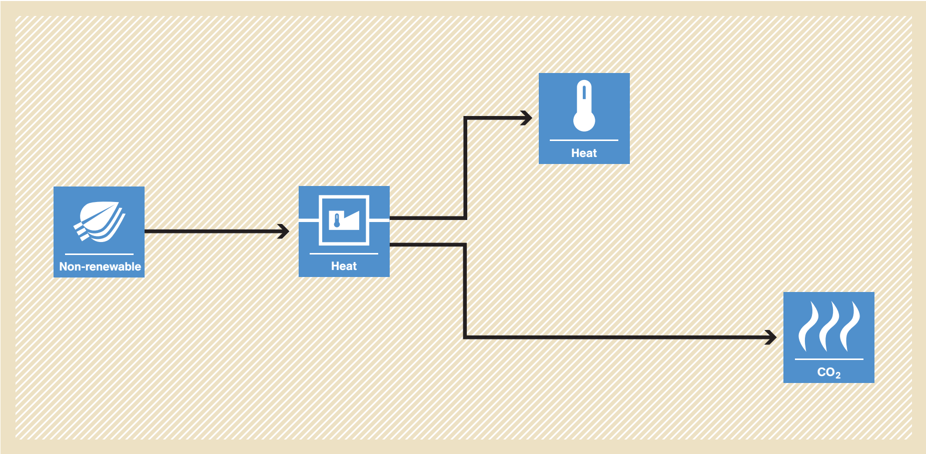
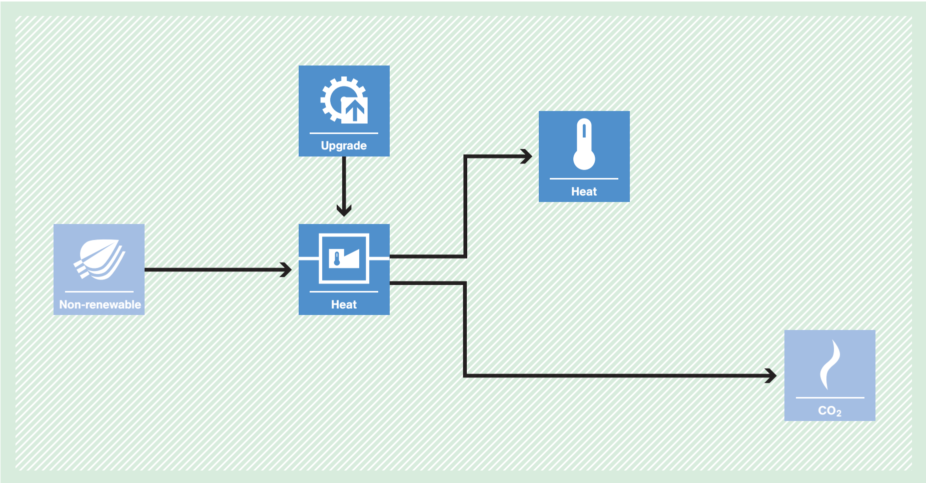
PROJECT SCENARIO
Use of more-efficient and/or less-carbon-intensive equipment in buildings.



AMS-II.F. Energy efficiency and fuel switching measures for agricultural facilities and activities

Typical project(s)	Energy efficiency and fuel switching measures implemented in agricultural activities of facilities or processes. Examples for such measures are efficient irrigation (e.g. adoption of drip/sprinkler irrigation to substitute flood irrigation), measures leading to a reduced requirement of farm power per unit area of land, as well as reducing fuel consumption in agriculture, such as reduced machinery use through, (e.g. elimination of tillage operations).
Type of GHG emissions mitigation action	• Energy efficiency; • Fuel switch. Displacement of more-GHG-intensive agricultural service(s).
Important conditions under which the methodology is applicable	• Installation of new equipment and/or retrofit of existing equipment is eligible; • Baseline and project scenarios of fuel consumption shall be demonstrated against reference agriculture activities, including cultivated average and crop yield; • Demonstration of additionality is necessary with respect to specific financial indicators especially to justify that reduced energy consumption is not prompted by financial constraints leading to downscaled operations.
Important parameters	Monitored: • Applicable for retrofits: The energy use of the agriculture facility, processes or the equipment affected; • Applicable for installation of new equipment: The energy use of the agriculture facility, processes or the equipment installed; • The characteristics and scale of the agriculture activities such as number of ha cultivated, crop yield.
BASELINE SCENARIO Installation and use of less-efficient agriculture facilities, processes and equipment.	
PROJECT SCENARIO Due to retrofitting and/or new installations, more-efficient agriculture facilities, processes and equipment are utilized resulting in reduced GHG emissions.	

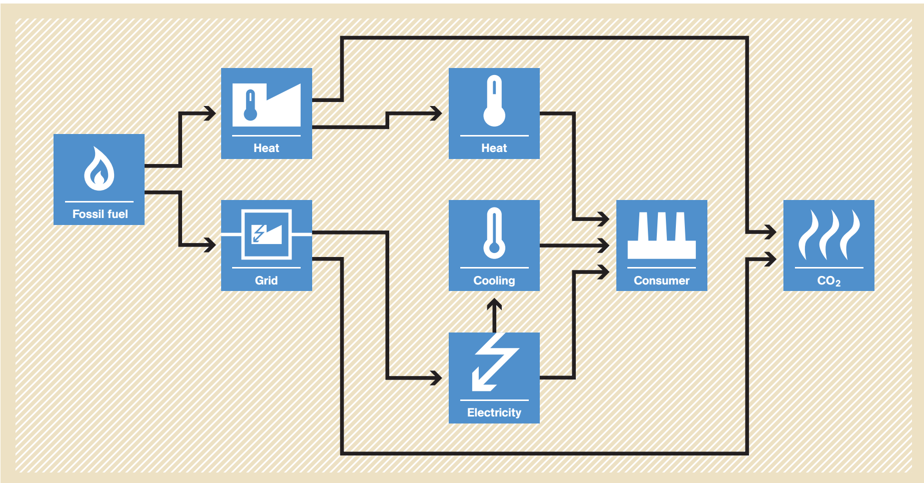
AMS-II.G. Energy efficiency measures in thermal applications of non-renewable biomass

Typical project(s)	Introduction of high-efficient thermal energy generation units utilizing non-renewable biomass or retrofitting of existing units (e.g. complete replacement of existing biomass fired cook stoves or ovens or dryers with more-efficient appliances) reduces use of non-renewable biomass for combustion.
Type of GHG emissions mitigation action	• Energy efficiency. Displacement or energy efficiency enhancement of existing heat generation units results in saving of non-renewable biomass and reduction of GHG emissions.
Important conditions under which the methodology is applicable	• It shall be demonstrated that non-renewable biomass has been used since December 31, 1989; • It shall be ensured that the proposed project is not replacing the non-renewable biomass accounted for by already registered project activities in the same region; • Project appliances are continuously operated at the specified efficiency (η_{new}) or replaced by an equivalent service appliance; • Project participants shall determine the share of renewable and non-renewable woody biomass in the quantity of woody biomass used in the absence of the project.
Important parameters	Monitored: • Annual check of efficiency of the project appliances (e.g. by representative sample); • Leakage: The amount of woody biomass saved under the project that is used by non-project households/users (who previously used renewable energy sources) shall be assessed from surveys.
BASELINE SCENARIO Continuation of the current situation; i.e. use of non-renewable biomass as fuel for the existing, less-efficient thermal applications.	
PROJECT SCENARIO Installation of more-efficient thermal energy generation units utilizing non-renewable biomass and/or complete replacement of existing less-efficient thermal applications and/or retrofitting of existing thermal energy generating appliances reduces GHG emissions by saving non-renewable biomass.	

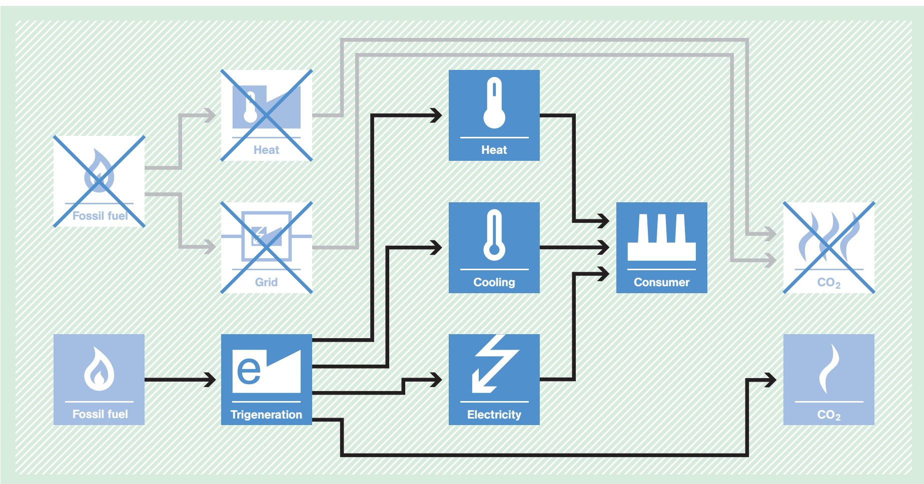
AMS-II.H. Energy efficiency measures through centralization of utility provisions of an industrial facility

Typical project(s)	Energy efficiency measures implemented through integration of a number of utility provisions into one single utility to produce power and heat and/or cooling (i.e. cogeneration/trigeneration systems) in an existing or new industrial facility.
Type of GHG emissions mitigation action	• Energy efficiency Displacement of several more-GHG-intensive utilities by a single, centralized utility.
Important conditions under which the methodology is applicable	• Displacement of cogeneration or trigeneration systems is not allowed; • For existing system, three years of historical data is required; • Definition of natural gas applies; • Project equipment containing refrigerants shall have no global warming potential and no ozone depleting potential.
Important parameters	At validation: • Definition of a reference baseline plant that would have been built in absence of the project; • Grid emission factor (can also be monitored ex post). Monitored: • Amount of electricity supplied to the industrial facility and/or the grid; • Quantity of fossil fuel and grid electricity consumed by the project; • Electrical and thermal energy delivered by the project.

BASELINE SCENARIO
Production of power/heat/cooling in separate element processes, e.g. grid and/or captive fossil-fuel-fired power plant, fossil-fuel-fired boiler for heat and electrical compression chillers for cooling.



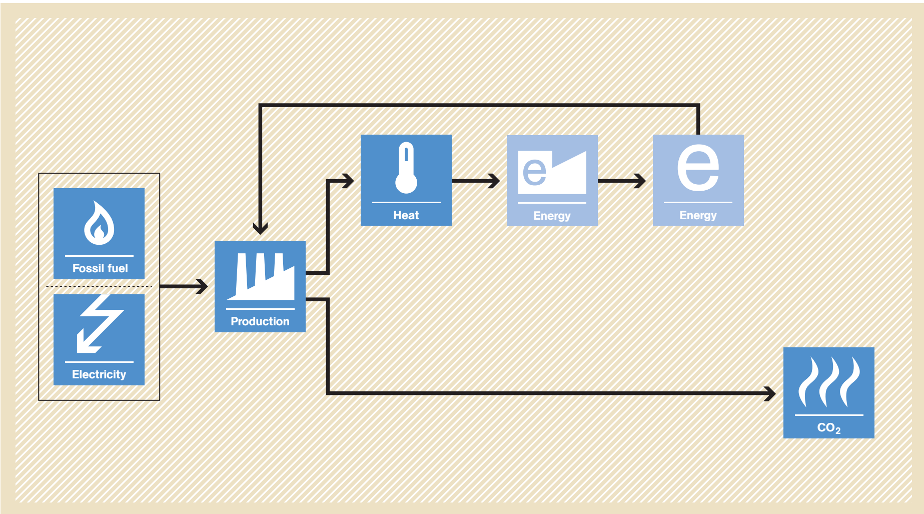
PROJECT SCENARIO
Simultaneous production of power/heat/cooling energy using cogeneration/trigeneration system, thus saving energy and reducing GHG emissions.



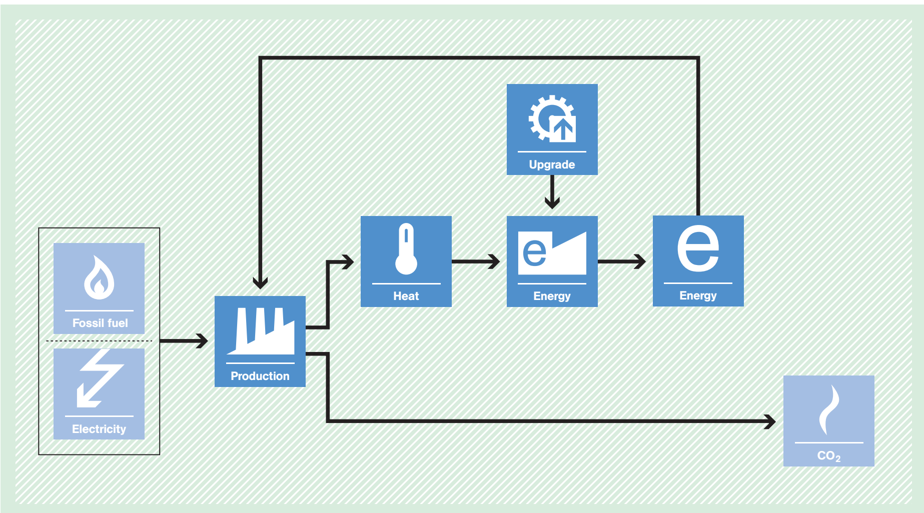
AMS-II.I. Efficient utilization of waste energy in industrial facilities

Typical project(s)	Energy efficiency improvement of an electricity or thermal energy generation unit, which is based on recovery of waste energy from a single source at an industrial, mining or mineral production facility.
Type of GHG emissions mitigation action	• Energy efficiency. Enhancement of waste energy recovery to replace more-GHG-intensive service.
Important conditions under which the methodology is applicable	• Production process and production outputs are homogenous in the baseline and project scenario; • Improvements in efficiency in the project are clearly distinguishable from other variables not attributable to the project; • There is no auxiliary fuel and/or co-firing for energy generation; • Methodology is not applicable to retrofitting of existing facilities to increase production outputs.
Important parameters	At validation: • Energy generation ratio of baseline equipment.
	Monitored: • Energy produced and consumed by the generating unit; • Production output of the facility.

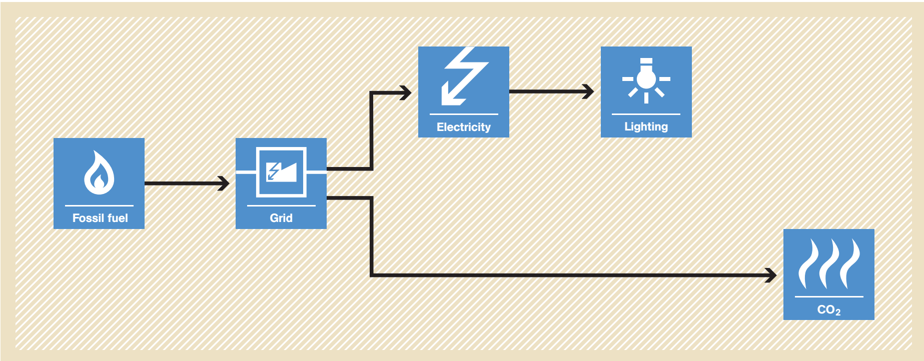
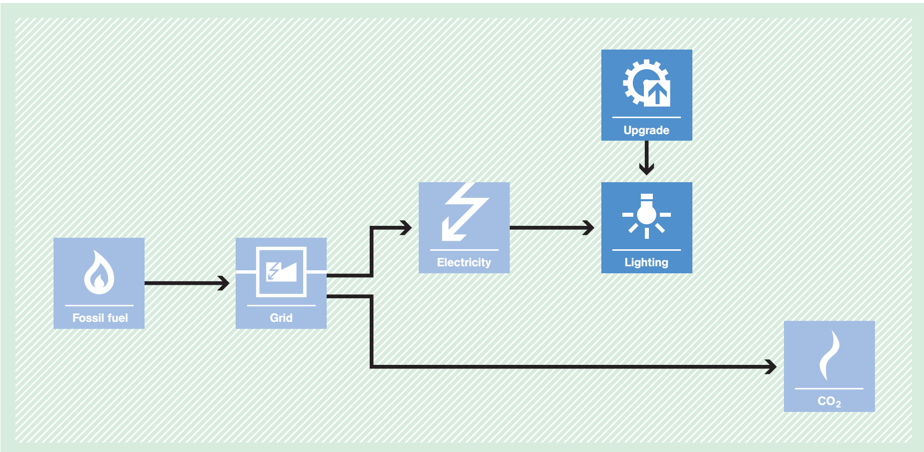
BASELINE SCENARIO
Continuation of the use of a less-efficient waste energy recovery system.



PROJECT SCENARIO
Use of a more-efficient waste energy recovery system, thus leading to higher energy gains and thereby replacement of energy provided by more-GHG-intensive means.



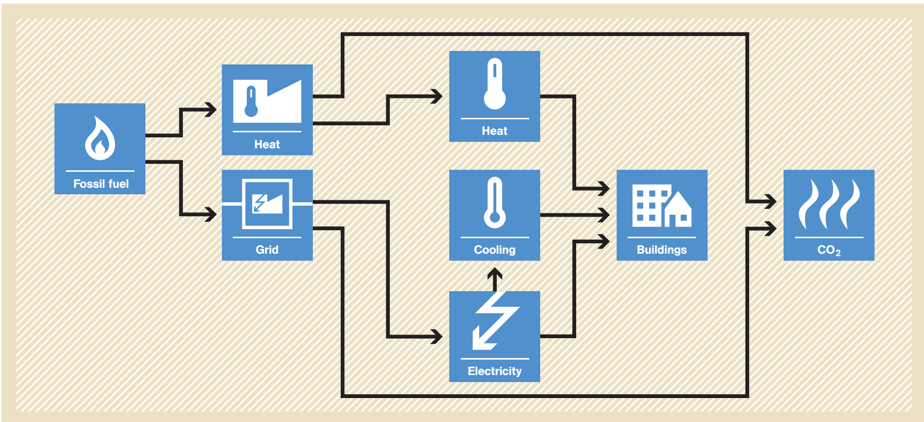
AMS-II.J. Demand-side activities for efficient lighting technologies

Typical project(s)	Activities for adoption of self-ballasted compact fluorescent lamps (CFLs) to replace incandescent lamps (ICLs) in residential applications.
Type of GHG emissions mitigation action	• Energy efficiency. Displacement of more-GHG-intensive lighting by technology switch.
Important conditions under which the methodology is applicable	• Total lumen output of the CFL should be equal to or more than that of the ICL being replaced and CFLs shall, in addition to the standard lamp specifications, be marked for clear unique identification for the project; • Average life or rated average life of the CFLs shall be known ex ante. IEC 60969 (Self Ballasted Lamps for General Lighting Services - Performance Requirements) or an equivalent national standard shall be used to determine the average life; • If cumulative failure of CFLs exceeds 50% of total number of CFLs installed by the project, then the project ceases to issue CERs not issue anymore CERs; • Determination of daily operating hours: either default value of 3.5 hours or measured value.
Important parameters	At validation: • Average life time of the CFL (can also be monitored ex post); • The number and power of the replaced ICLs; • Number of ICLs distributed under the project, identified by the type of ICL and the date of supply; • Grid emission factor (can also be monitored ex post).
	Monitored: • If applicable: Measurement of average daily operating hours; • Lamp failure rate surveys.
BASELINE SCENARIO Incandescent lamps (ICLs) are used for lighting in households.	
PROJECT SCENARIO CFLs for lighting in households replace ICLs thus reducing electricity consumption and GHG emissions.	

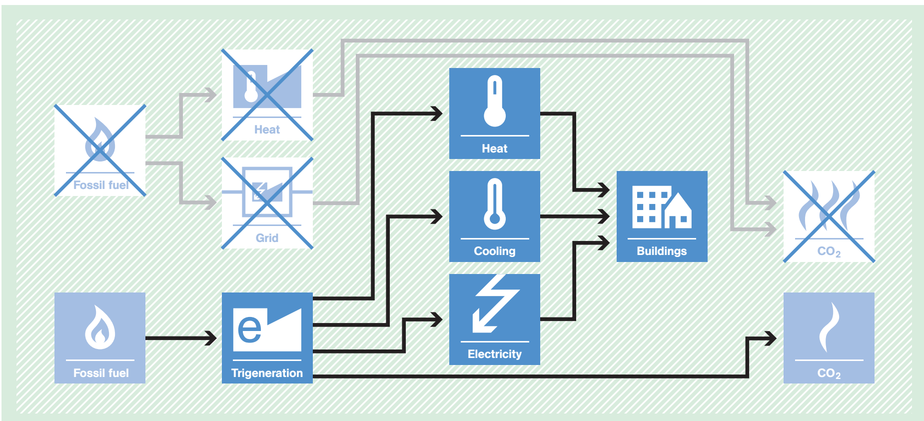
AMS-II.K. Installation of co-generation or tri-generation systems supplying energy to commercial building

Typical project(s)	Installation of fossil-fuel-based cogeneration or trigeneration systems. Generated electricity and cooling, and/or heating are supplied to commercial, non-industrial buildings.
Type of GHG emissions mitigation action	• Energy efficiency. Electricity and/or fuel savings through energy efficiency improvement.
Important conditions under which the methodology is applicable	• Applicable to installation of new systems that replace or supplement existing systems that supply electricity (grid or on-site generation) and cooling (e.g. chillers) and/or heating systems (e.g. boilers) or electricity and cooling and/or heating systems that would have been built and utilized; • Not applicable to the replacement of existing cogeneration or trigeneration systems; • If it is identified that the baseline situation is the continued use of an existing system then the existing system must have been in operation for at least the immediately prior three years; • If project equipment contains refrigerants it shall have no global warming potential and no ozone depleting potential.
Important parameters	At validation: • Emission factor of the grid (can also be monitored ex post) and/or baseline captive power plants; • COP of baseline chillers; • Efficiency of baseline steam generation systems.
	Monitored: • Amount of grid and/or captive power supplied by the project; • Amount of cooling and/or heating energy supplied by the project.

BASELINE SCENARIO
Separate generation of power/heat/cooling supplied to commercial, non-industrial buildings.



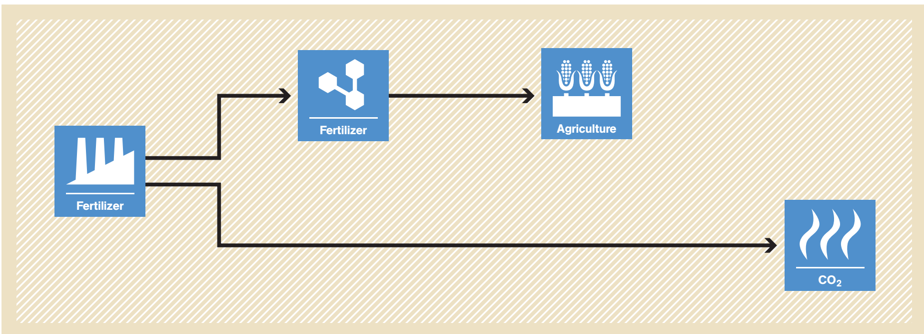
PROJECT SCENARIO
Simultaneous production of power/heat/cooling using a co- or trigeneration system for supplying commercial, non-industrial buildings.



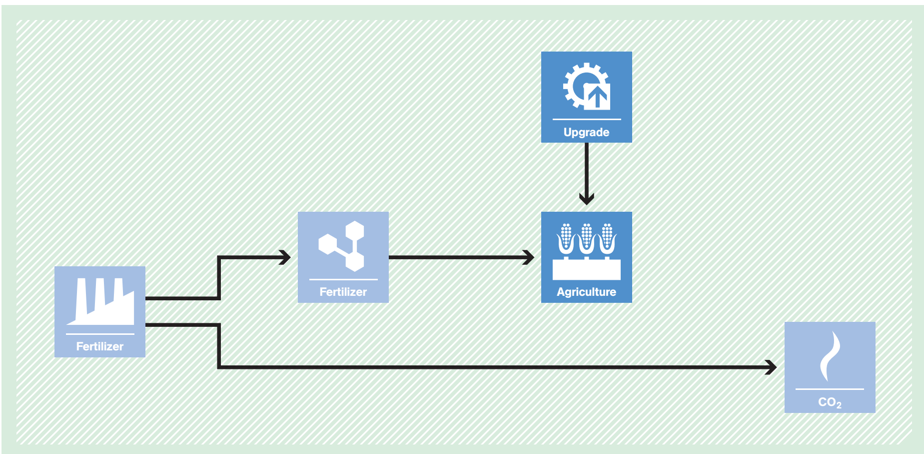
AMS-III.A. Offsetting of synthetic nitrogen fertilizers by inoculant application in legumes-grass rotations on acidic soils on existing cropland

Typical project(s)	Application of inoculant on legumes in a legumes-grass rotation cropping on acidic soils on existing cropland substitutes and reduces the production and use of synthetic nitrogen fertilizer use.
Type of GHG emissions mitigation action	• GHG emission avoidance. Application of inoculant displaces more-GHG-intensive production of synthetic nitrogen fertilizers.
Important conditions under which the methodology is applicable	• The farmers participating have grown legumes and grass in a legumes-grass rotation in the previous three complete rotations without using any inoculant as a fertilizer for legumes, but have used synthetic nitrogen fertilizer for fertilizing legumes; • Only the legume-rhizobia bacteria (inoculant) combinations specied in the methodology are eligible; • For each farmer taking part in the project, reliable and veriable data on the amount of synthetic nitrogen fertilizer used, separately for each crop type, in the previous three complete rotations of legumes and grass cropping, shall be available; • No change in the types of crop cultivated takes place. In both the baseline and project situation legumes and grass are cultivated in rotations. No other changes in farming practices affecting fertilizer application, except the change in application of inoculant and synthetic nitrogen fertilizer, are taking place during the crediting period.
Important parameters	Monitored: • Hectare of crop planted; • Quantity of inoculant (number of rhizobia bacteria), urea and other fertilizers applied (chemical fertilizers as well as organic fertilizers); • Crop yield per crop per hectare; • Independent third party field visits are also required at different stages (e.g. at planting, right before owering etc.).

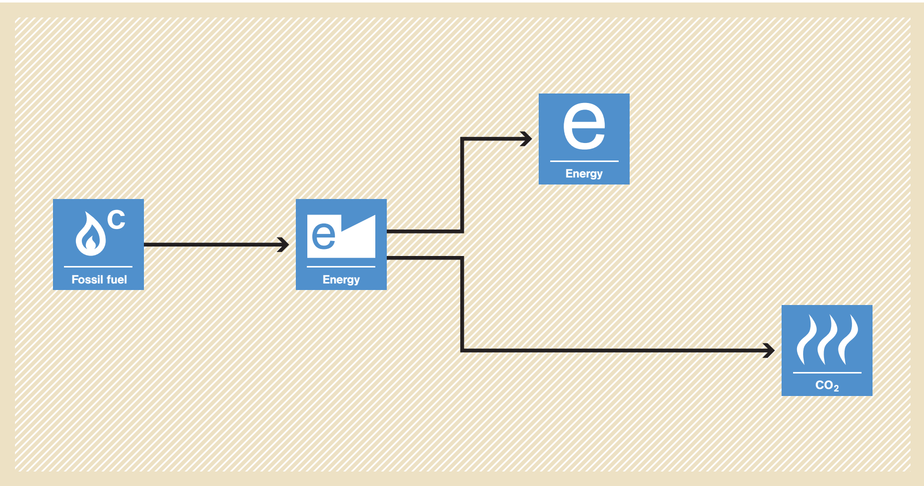
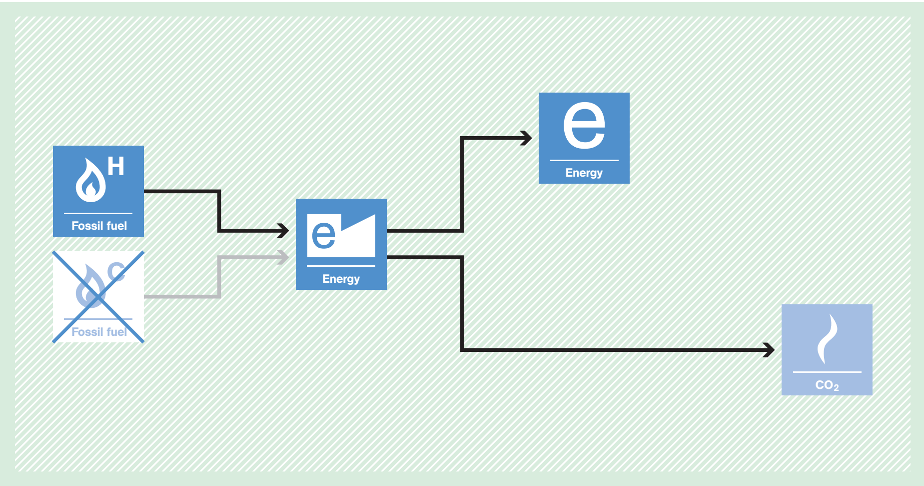
BASELINE SCENARIO
Production and use of synthetic nitrogen fertilizer results in GHG emissions.



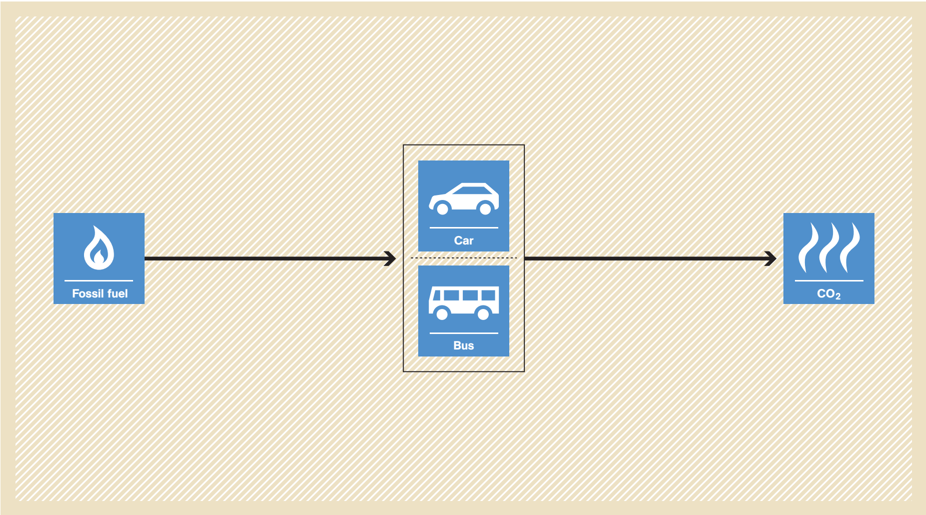
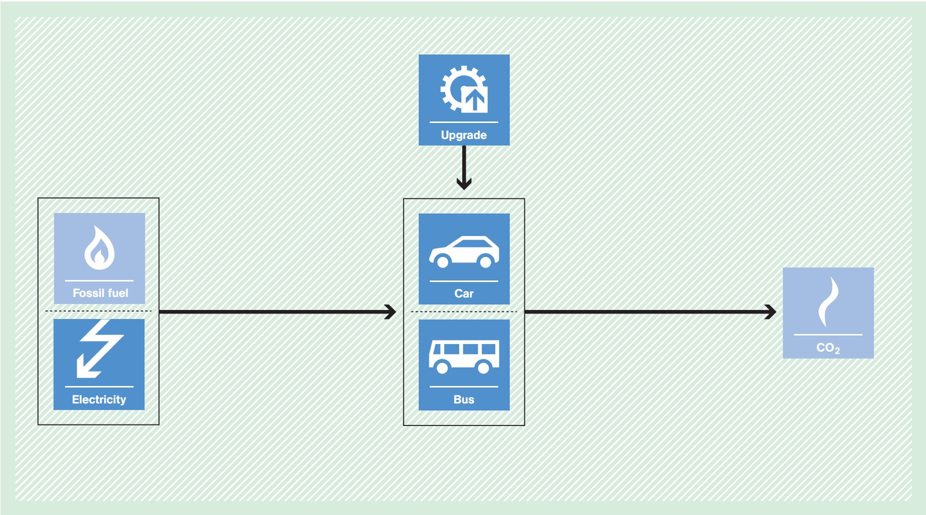
PROJECT SCENARIO
Use of legume-rhizobia bacteria (inoculant) substitutes/reduces the use of synthetic nitrogen fertilizer reducing GHG emissions in the fertilizer production process.



AMS-III.B. Switching fossil fuels

Typical project(s)	The fossil fuel switching in new or existing industrial, residential, commercial, institutional or electricity generation applications.
Type of GHG emissions mitigation action	• Fuel switch. Switch to fuel with a lower GHG intensity.
Important conditions under which the methodology is applicable	• Switch of fossil fuel used in a process with a single output; • Projects including biomass or waste gas/energy are not eligible; • Only energy efficiency increase related to the fuel switch is eligible; • Only retrofitting and replacements without capacity expansion and/or integrated process change are eligible. It is possible to directly measure and record the energy use/output (e.g. heat and electricity) and consumption (e.g. fossil fuel) within the project boundary.
Important parameters	At validation: • Baseline emission factor; • Historical net energy output.
	Monitored: • Quantity of fossil fuel use; • Output of element process for electricity/thermal energy exported to other facilities shall be monitored at the recipient end.
BASELINE SCENARIO Continuation of the current practice, i.e. use of more-carbon-intensive fossil fuel for energy generation equipment.	
PROJECT SCENARIO Switch of fuel to less-carbon-intensive fossil fuel in energy generation equipment.	

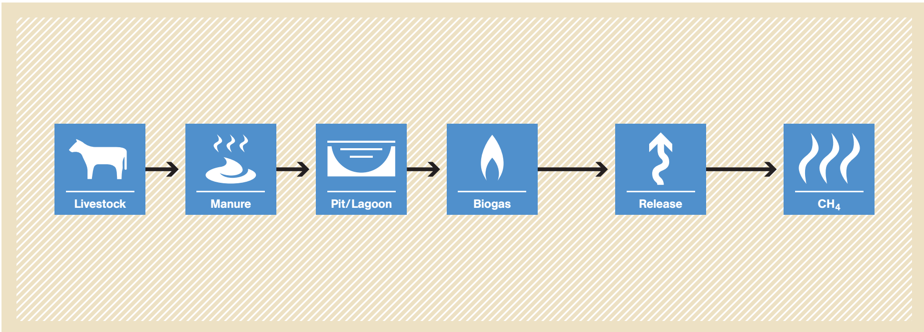
AMS-III.C. Emission reductions by electric and hybrid vehicles

Typical project(s)	Operation of electric and hybrid vehicles for providing transportation services.
Type of GHG emissions mitigation action	• Fuel switch. Displacement of more-GHG-intensive vehicles.
Important conditions under which the methodology is applicable	• Not applicable.
Important parameters	At validation: • If applicable: grid emission factor (can also be monitored ex post). Monitored: • Number of electric/hybrid vehicles operated under the project shall be tracked and the annual units (e.g. person-km driven) of service should be determined; • Quantity of fossil fuel used e.g. for hybrid vehicles and electricity consumption for all electric and hybrid vehicles.
BASELINE SCENARIO Operation of more-GHG-emitting vehicles for providing transportation services.	
PROJECT SCENARIO Operation of less-GHG-emitting vehicles with electric/hybrid engines for providing transportation services.	

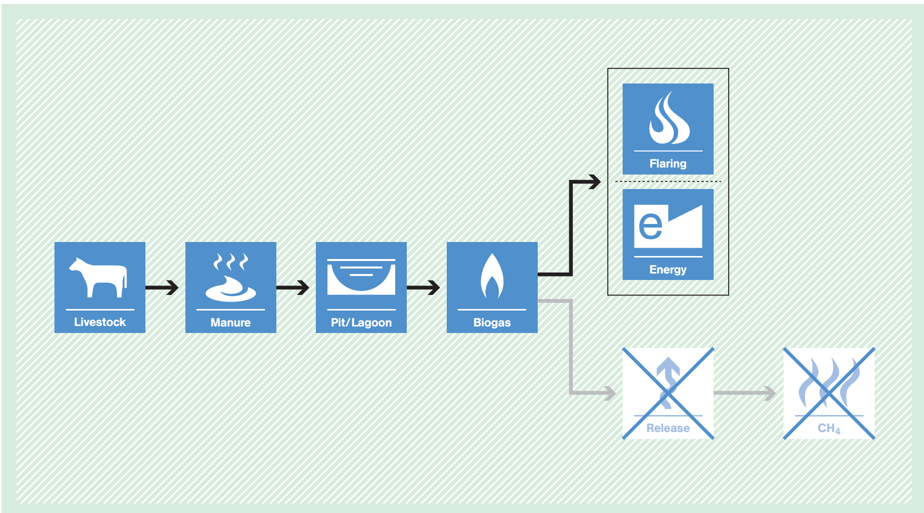
AMS-III.D. Methane recovery in animal manure management systems

Typical project(s)	Replacement or modification of existing anaerobic manure management systems in livestock farms to achieve methane recovery and destruction by flaring/combustion or energetic use of the recovered methane.
Type of GHG emissions mitigation action	• GHG destruction. GHG destruction and displacement of more-GHG-intensive service.
Important conditions under which the methodology is applicable	• Manure or the streams obtained after treatment are not discharged into natural water resources (e.g. river or estuaries); • In the baseline scenario the retention time of manure waste in the anaerobic treatment system is greater than one month, and in case of anaerobic lagoons in the baseline, their depths are at least 1 m; • Final sludge must be handled aerobically; • The storage time of the manure after removal from the animal barns, including transportation, should not exceed 45 days before being fed into the anaerobic digester, unless it can be demonstrated that the dry matter content of the manure when removed from the animal barns is more than 20%.
Important parameters	Monitored: • Amount of biogas recovered and fuelled, flared or used gainfully; • The annual amount of fossil fuel or electricity used to operate the facility or auxiliary equipment; • Fraction of the manure handled in the manure management system, the average weight of the livestock and the livestock population. • Proper soil application (not resulting in methane emissions) of the final sludge must be monitored

BASELINE SCENARIO
Animal manure is left to decay anaerobically and methane is emitted into the atmosphere.



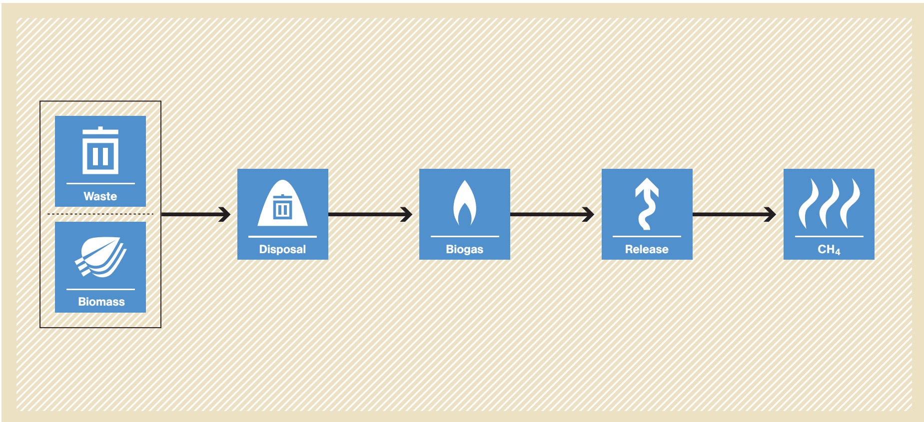
PROJECT SCENARIO
Methane is recovered and destructed or gainfully used due to replacement or modification of existing anaerobic manure management systems.



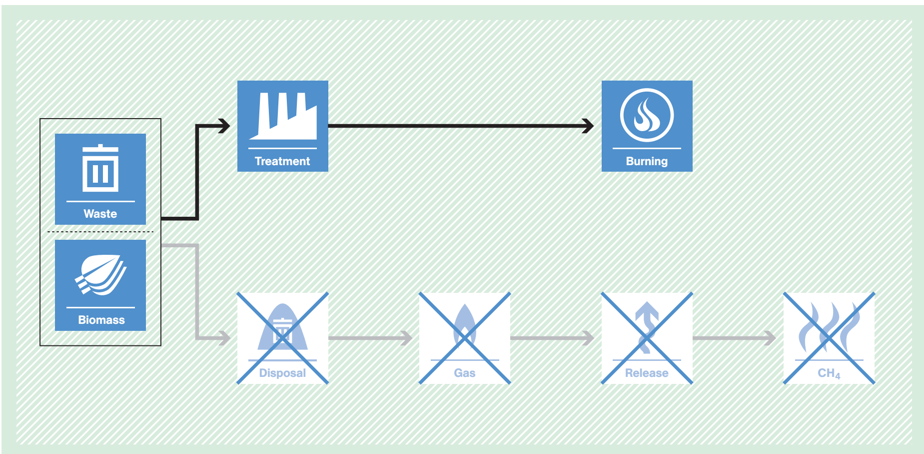
AMS-III.E. Avoidance of methane production from decay of biomass through controlled combustion, gasification or mechanical/thermal treatment

Typical project(s)	Decay of the wastes that would have been left to decay or are already deposited in a waste disposal site is prevented through controlled combustion; or gasification to produce syngas/producer gas; or mechanical/thermal treatment to produce refuse-derived fuel (RDF) or stabilized biomass (SB).
Type of GHG emissions mitigation action	• GHG emission avoidance; Avoidance of methane emissions due to prevention of anaerobic decay of biomass in waste. Use of biomass in waste as energy source.
Important conditions under which the methodology is applicable	• The produced RDF/SB shall be used for combustion either onsite or off-site; • In case of RDF/SB production, no GHG emissions occur other than biogenic CO_2, due to chemical reactions during the thermal treatment process for example limiting the temperature of thermal treatment to prevent the occurrence of pyrolysis and/or the stack gas analysis; • In case of gasification, all syngas produced shall be combusted and not released unburned into the atmosphere; • During the mechanical/thermal treatment to produce RDF/SB no chemical or other additives shall be used.
Important parameters	Monitored: • Amount of waste combusted, gasified or mechanically/thermally treated by the project, as well as its composition through representative sampling; • Quantity of auxiliary fuel used and the non-biomass carbon content of the waste or RDF/SB combusted; • Electricity consumption and/or generation.

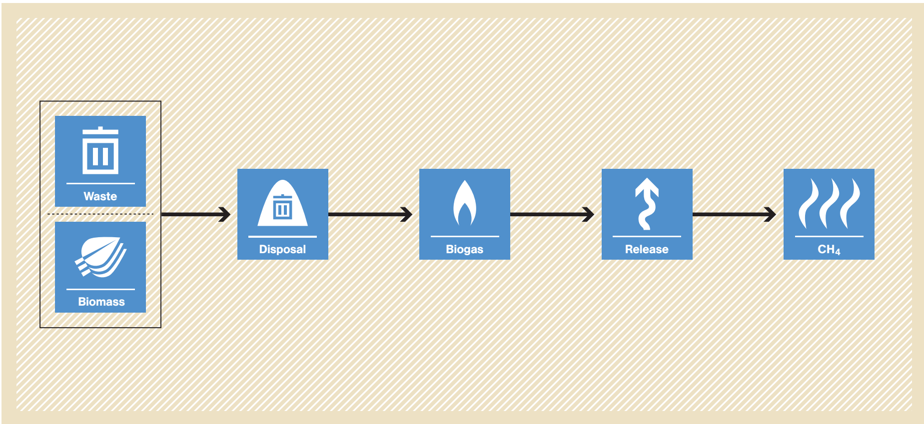
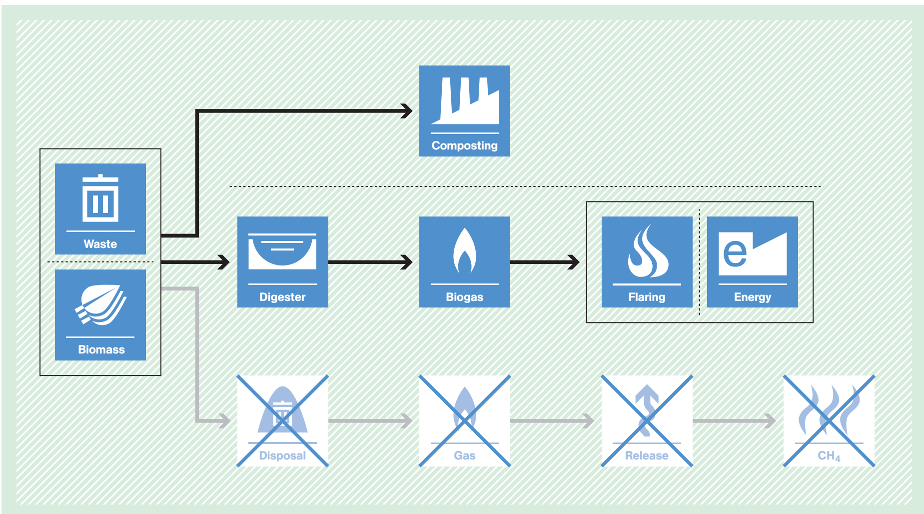
BASELINE SCENARIO
Organic waste is left to decay and methane is emitted into the atmosphere.



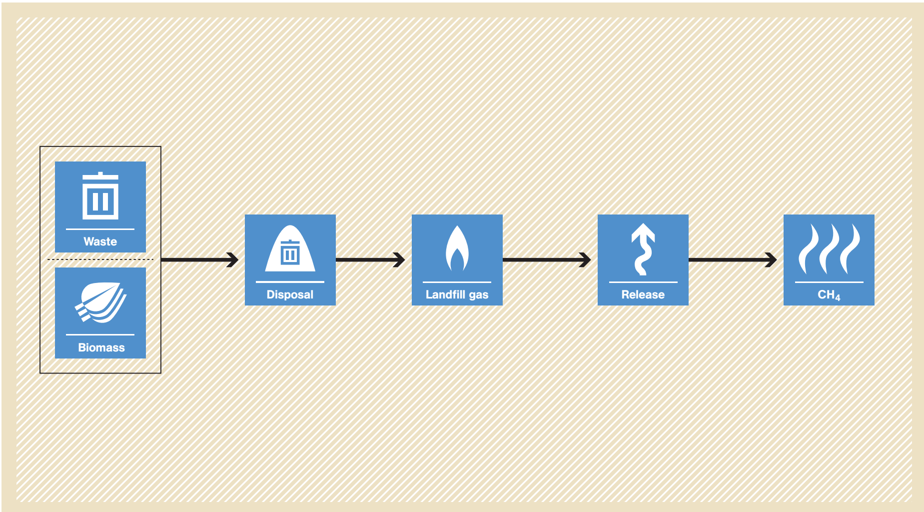
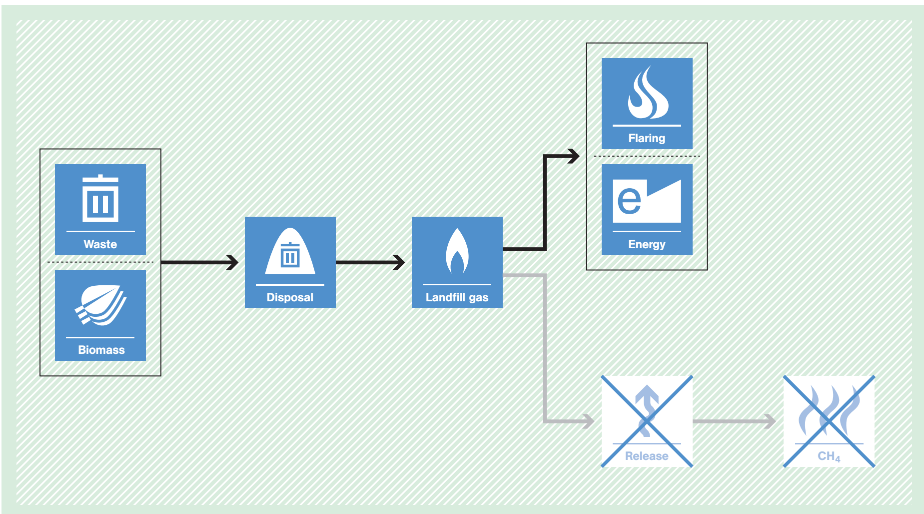
PROJECT SCENARIO
Methane emissions will be avoided through controlled combustion, gasification or mechanical/thermal treatment of the wastes. In case of energetic use of organic waste, displacement of more-GHG-intensive energy generation.



AMS-III.F. Avoidance of methane emissions through controlled biological treatment of biomass

Typical project(s)	Controlled biological treatment of biomass or other organic matter is introduced through one, or a combination, of the following measures: aerobic treatment by composting and proper soil application of the compost; or anaerobic digestion in closed reactors equipped with biogas recovery and combustion/flaring system.
Type of GHG emissions mitigation action	• GHG emission avoidance; Avoidance of GHG emissions and displacement of more-GHG-intensive service.
Important conditions under which the methodology is applicable	• Recovery and combustion of landfill gas is not eligible; • In the case of composting of solid waste, identified landfill(s) should be able to accommodate the waste to be used for the project for the duration of the crediting period; or it is common practice in the region to dispose of the waste in solid waste disposal sites (landfills).
Important parameters	Monitored: • Quantity of waste biologically treated and its composition through representative sampling; • When project includes co-treating of wastewater, the volume of co-treated wastewater and its COD content through representative sampling; • In case of controlled anaerobic digestion and biogas production, the amount of biogas fuelled, flared or gainfully used; • Annual amount of fossil fuel or electricity used to operate the facilities or auxiliary equipment.
BASELINE SCENARIO Biomass and other organic matter (including manure where applicable) are left to decay and methane is emitted into the atmosphere.	
PROJECT SCENARIO Methane emissions are avoided through composting or methane is recovered and destructed/used through the introduction of an anaerobic digester. In case of energetic use of biogas, displacement of more-GHG-intensive energy generation.	

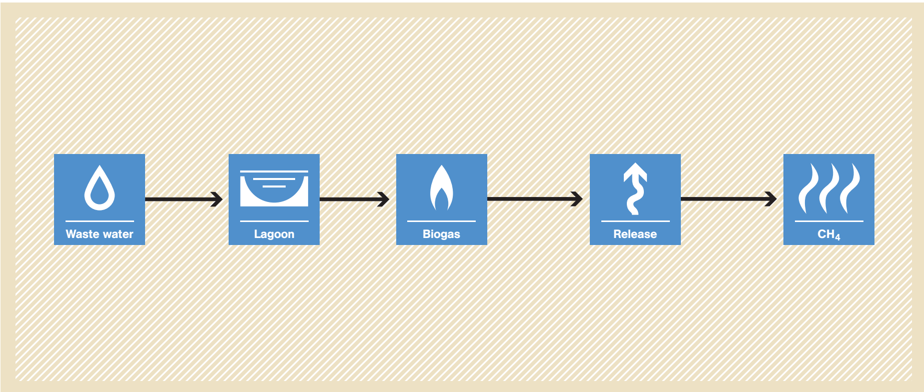
AMS-III.G. Landfill methane recovery

Typical project(s)	Capture and combustion of methane from landfills used for disposal of residues from human activities including municipal, industrial and other solid wastes containing biodegradable organic matter.
Type of GHG emissions mitigation action	• GHG destruction; Destruction of methane and more-GHG-intensive service displacement.
Important conditions under which the methodology is applicable	• Baseline emissions shall exclude methane emissions that would have to be removed to comply with national or local safety requirement or legal regulations.
Important parameters	Monitored: • The amount of methane recovered and gainfully used, fuelled or flared shall be monitored ex-post, using continuous flow meters; • Fraction of methane in the landfill gas; • Flare efficiency.
BASELINE SCENARIO Biomass and other organic matter in waste are left to decay and methane is emitted into the atmosphere.	
PROJECT SCENARIO Methane in the landfill gas is captured and destructed or used. In case of energetic use of landfill gas, displacement of more-GHG-intensive energy generation.	

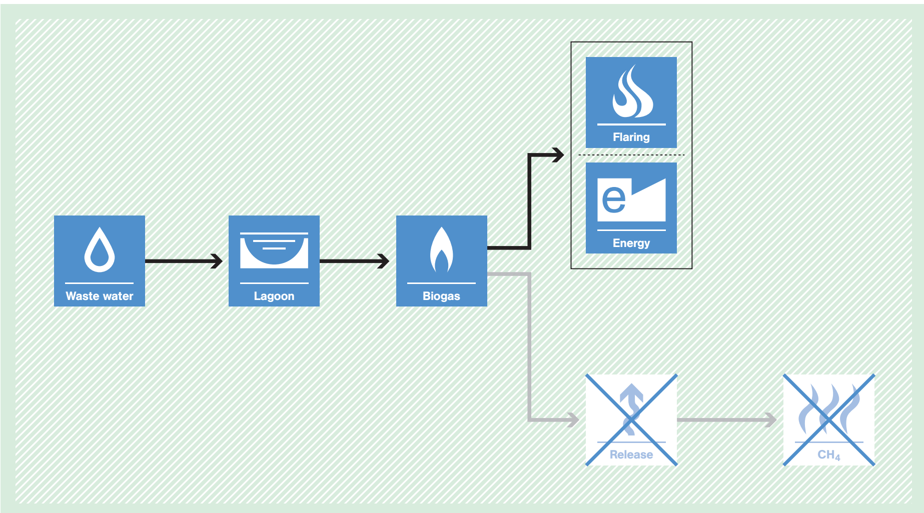
AMS-III.H. Methane recovery in wastewater treatment

Typical project(s)	Recovery of biogas resulting from anaerobic decay of organic matter in wastewaters through introduction of anaerobic treatment system for wastewater and/or sludge treatment.
Type of GHG emissions mitigation action	• GHG destruction; Destruction of methane emissions and displacement of more-GHG-intensive service.
Important conditions under which the methodology is applicable	• Anaerobic lagoons should be deeper than 2 metres, without aeration, ambient temperature above 15°C, at least during part of the year, on a monthly average basis. The minimum interval between two consecutive sludge removal events shall be 30 days; • In determining baseline emissions, historical records of at least one year prior to the project implementation shall be available. Otherwise, a representative measurement campaign is required.
Important parameters	At validation: • COD removal efficiency of the baseline system.
	Monitored: • Flow of wastewater; • Chemical oxygen demand of the wastewater before and after the treatment system; • Amount of sludge as dry matter in each sludge treatment system; • Amount of biogas recovered, fuelled, flared or utilized (e.g. injected into a natural gas distribution grid or distributed via a dedicated piped network).

BASELINE SCENARIO
Methane from the decay of organic matter in wastewater or sludge is being emitted into the atmosphere.



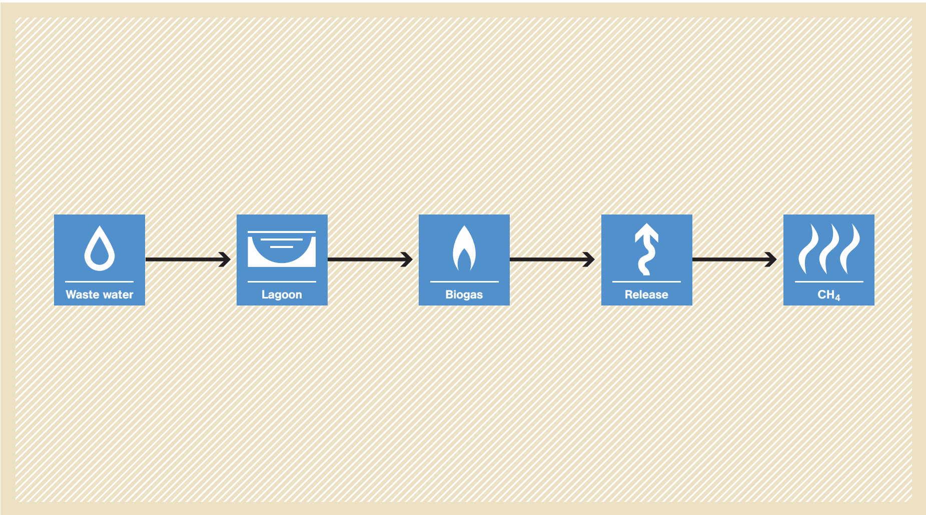
PROJECT SCENARIO
Methane is recovered and destroyed due to the introduction of new or modification of existing wastewater or sludge treatment system. In case of energetic use of biogas, displacement of more-GHG-intensive energy generation.



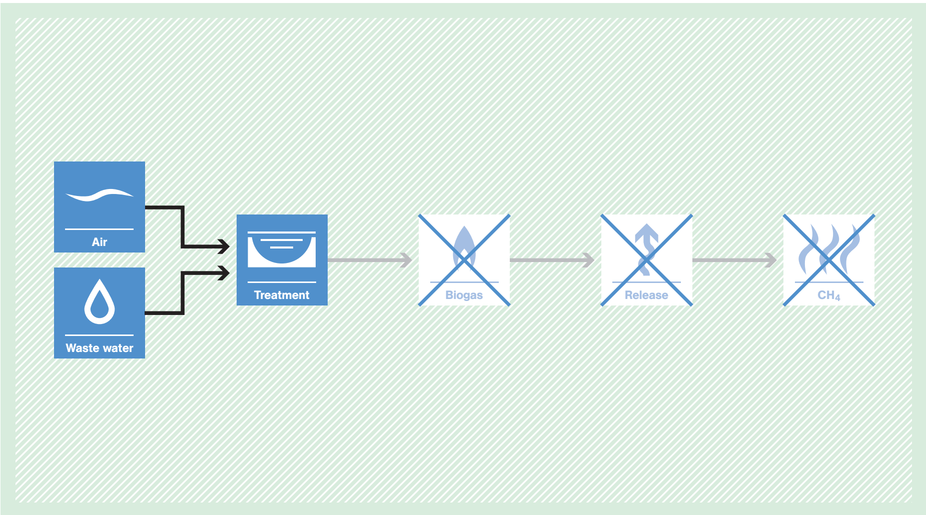
AMS-III.I. Avoidance of methane production in wastewater treatment through replacement of anaerobic systems by aerobic systems

Typical project(s)	Avoidance of production of methane from organic matter in wastewater being treated in anaerobic systems. Due to the project, the anaerobic systems (without methane recovery) are substituted by aerobic biological systems.
Type of GHG emissions mitigation action	• GHG emission avoidance. Avoidance of methane emissions from anaerobic decay of organic matter in wastewater.
Important conditions under which the methodology is applicable	• In order to determine baseline emissions, at lease one year of historical data is required. Otherwise, a 10-day measurement campaign should be carried out.
Important parameters	At validation: • COD removal efficiency of the baseline system.
	Monitored: • Amount of COD treated in the wastewater treatment plant(s), amount of wastewater entering and/or exiting the project; • Amount of sludge produced and sludge generation ratio; • Amount of fossil fuel and electricity used by the project facilities; • Use of the final sludge will be monitored during the crediting period.

BASELINE SCENARIO
Organic matter in wastewaters is being treated in anaerobic systems and produced methane is being released into the atmosphere.



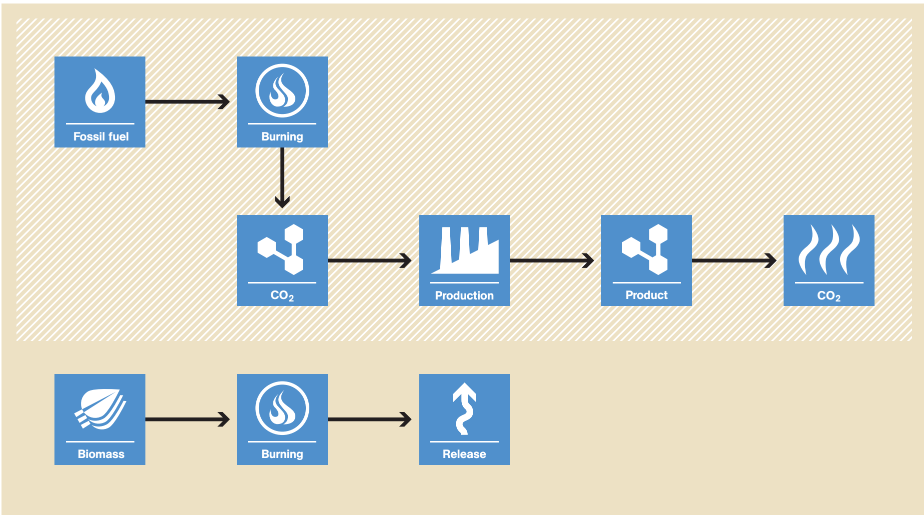
PROJECT SCENARIO
Anaerobic wastewater treatment systems, without methane recovery, are substituted by aerobic treatment systems.



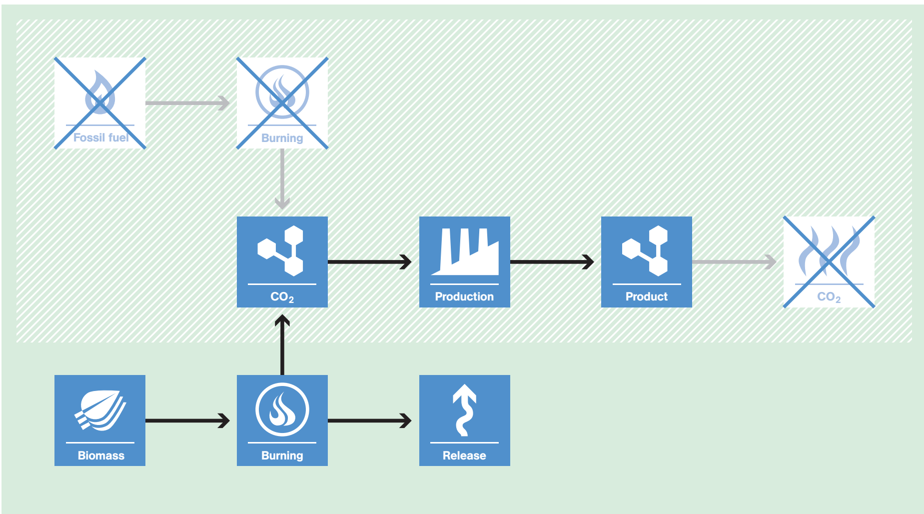
AMS-III.J. Avoidance of fossil fuel combustion for carbon dioxide production to be used as raw material for industrial processes

Typical project(s)	Switch from CO_2 of fossil origin to a source of CO_2 from renewable origin.
Type of GHG emissions mitigation action	• Feedstock switch. Avoidance of fossil fuel combustion to provide CO_2 by the use of CO_2 that is generated from renewable sources.
Important conditions under which the methodology is applicable	• CO_2 from combustion of renewable biomass would have been emitted into the atmosphere and not otherwise used; • The generation of CO_2 from fossil or mineral sources in the baseline is only for the purpose of CO_2 production to be used for the production of inorganic compounds; • CO_2 from fossil or mineral sources that is used for the production of inorganic compounds prior to the project will not be emitted into the atmosphere when the project is in place.
Important parameters	At validation: • Historical specific fuel consumption per tonne of output. Monitored: • Amount of the final product produced on a monthly basis.

BASELINE SCENARIO
Fossil fuels are used to produce CO_2 which is used as raw material; CO_2 from a renewable source is vented into the atmosphere.



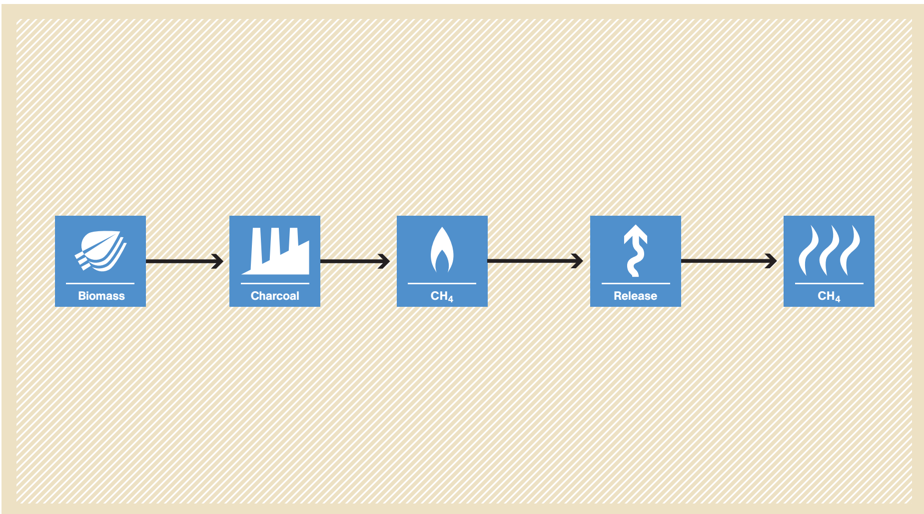
PROJECT SCENARIO
Fossil fuels are no longer used to produce CO_2. The CO_2 stream from renewable sources is used as raw material for a production process.



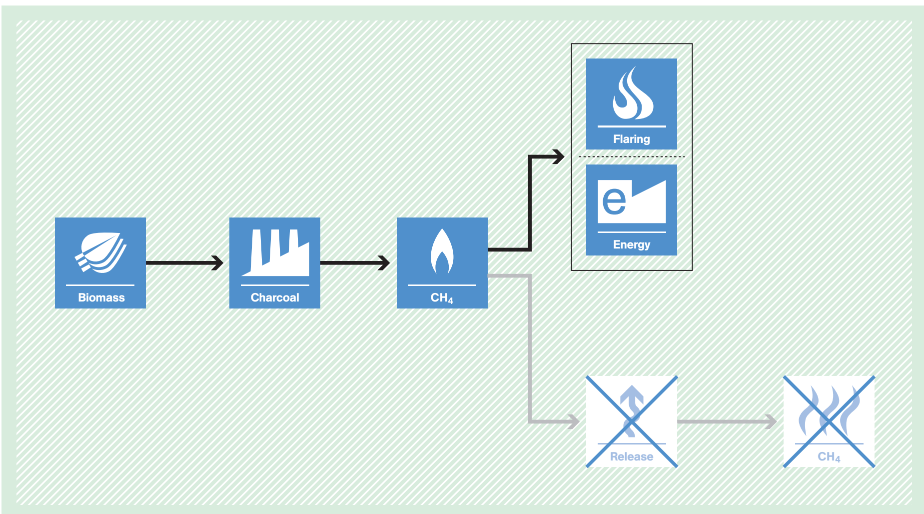
AMS-III.K. Avoidance of methane release from charcoal production by shifting from traditional open-ended methods to mechanized charcoaling process

Typical project(s)	Construction of a new charcoal production facility with recovery and flaring/combustion of methane.
Type of GHG emissions mitigation action	• GHG destruction. Use of a technology that destructs or recovers methane generated during the production of charcoal.
Important conditions under which the methodology is applicable	• Laws restricting methane emissions from charcoal production either do not exist or are not enforced; • No relevant changes in greenhouse gas emissions other than methane occur as a consequence of the project and/or need to be accounted for; • No changes in the type and source of biomass used for charcoal production.
Important parameters	At validation: • Methane emission factor in the baseline.
	Monitored: • Quantity of raw material used and its moisture content; • Quantity of charcoal produced and its moisture content; • Amount of methane generated, fuelled or flared; • Power and auxiliary fuel consumption of the facility.

BASELINE SCENARIO
Biomass is transformed into charcoal. Methane is emitted in the process.



PROJECT SCENARIO
Biomass is transformed into charcoal. Methane is recovered and combusted. In case of energetic use of methane, displacement of more-GHG-intensive energy generation.



AMS-III.L. Avoidance of methane production from biomass decay through controlled pyrolysis

Typical project(s)

Avoidance of the production of methane from organic matter that would have otherwise been left to decay under anaerobic conditions in a solid waste disposal site without methane recovery. Due to the project, decay is prevented through controlled pyrolysis.

Type of GHG emissions mitigation action

- GHG emission avoidance;

GHG emission avoidance and replacement of more-GHG-intensive service by pyrolysis of organic matter.

Important conditions under which the methodology is applicable

- The pyrolysed residues are no longer prone to anaerobic decomposition;
- Measures shall include recovery and combustion of non-CO_2 greenhouse gases produced during pyrolysis;
- The location and characteristics of the disposal site in the baseline condition shall be known, in such a way as to allow the estimation of its methane emissions.

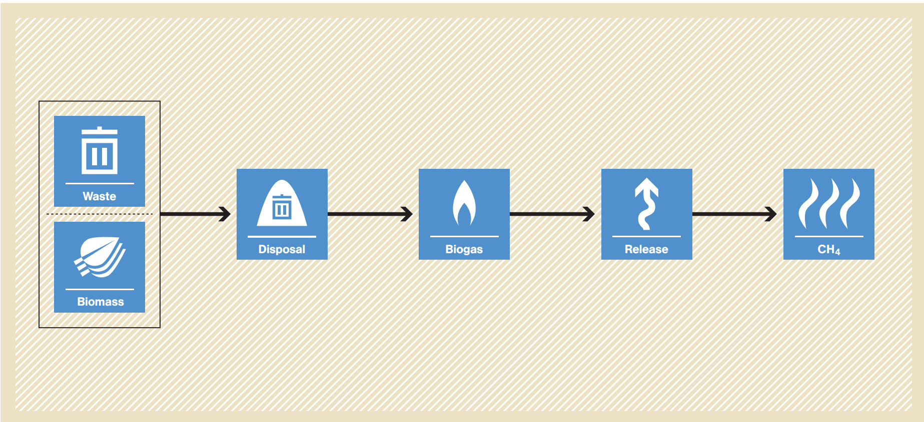
Important parameters

Monitored:

- Percentage composition of volatile carbon, fixed carbon, ashes and moisture in the waste processed by pyrolysis (by a representative number of samples).
- Amount and composition (weight fraction of each waste type) of waste processed by pyrolysis;
- Quantity of non-biogenic waste processed by pyrolysis;
- Quantity of auxiliary fuel used and power consumption of the project facilities and/or power generation by the project.

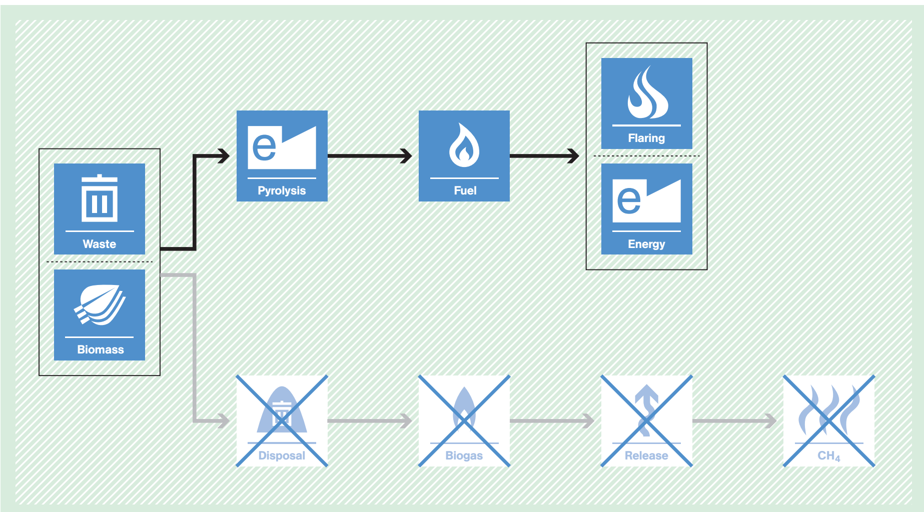
BASELINE SCENARIO

Organic matter will decay under clearly anaerobic conditions in a solid waste disposal site and the produced methane is being released into the atmosphere.



PROJECT SCENARIO

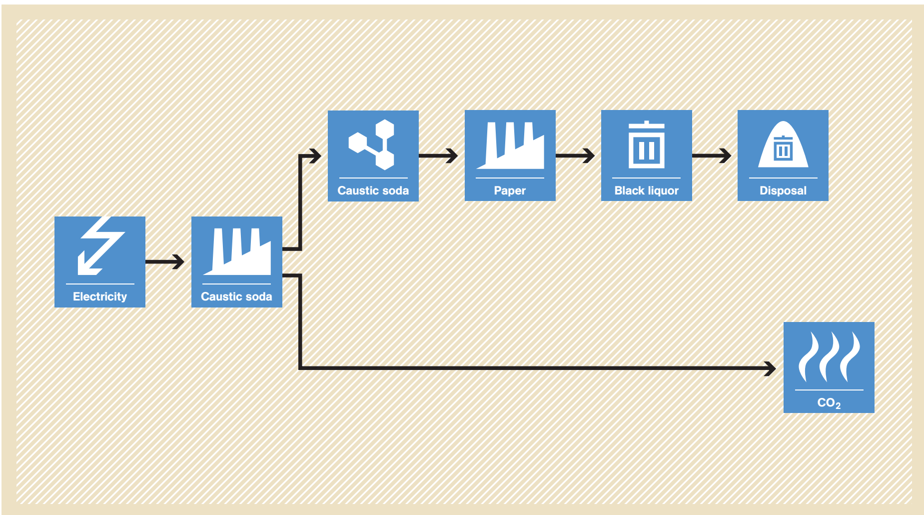
Methane production due to anaerobic decay of organic matter will be avoided through controlled pyrolysis. In case of energetic use of products (e.g. pyrolysis gas or oil), displacement of more-GHG-intensive energy generation.



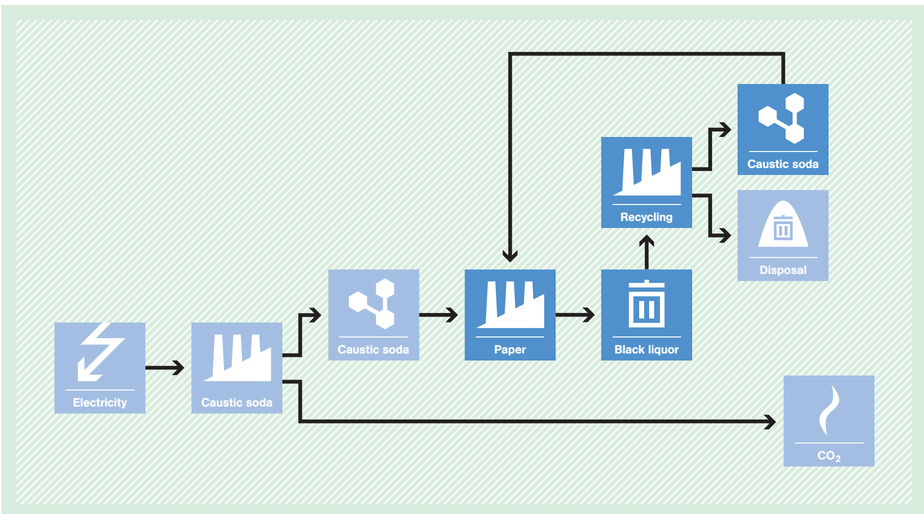
AMS-III.M. Reduction in consumption of electricity by recovering soda from paper manufacturing process

Typical project(s)	Recovery of caustic soda from waste black liquor generated in paper manufacturing.
Type of GHG emissions mitigation action	• GHG emission avoidance. Reduction of production of caustic soda and thereby reduction of electricity consumption by recovery of caustic soda from black liquor.
Important conditions under which the methodology is applicable	• Not applicable.
Important parameters	At validation: • Historical electricity intensity of soda production (including imports); • Grid emission factor (can also be monitored ex post).
	Monitored: • Quantity of caustic soda recovered per year; • Electricity consumption, consumption of fossil fuel and auxiliary fuel in the caustic soda recovery plant; • Quantity of residues produced, portion of residue used for the production of lime and portion of residue that is disposed in a solid waste disposal site.

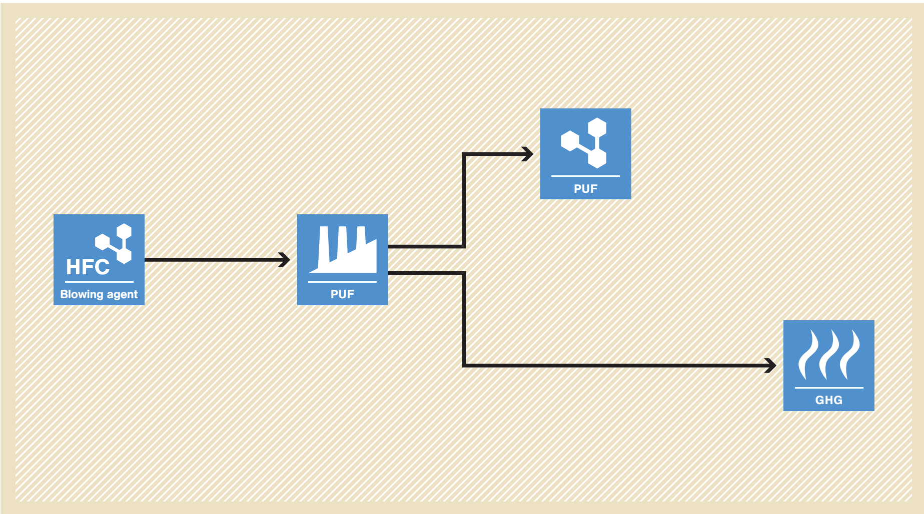
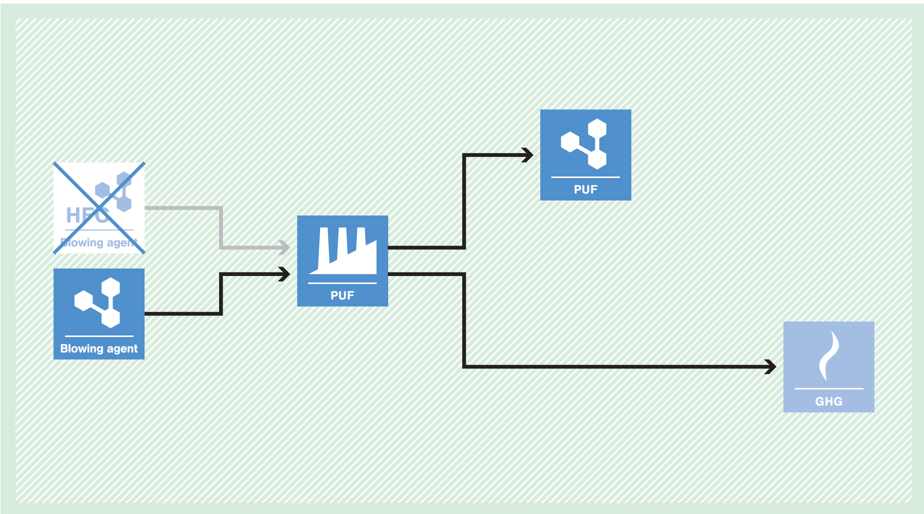
BASELINE SCENARIO
Black liquor from paper production is wasted. Much electricity is needed to produce caustic soda that is consumed in the paper mill.



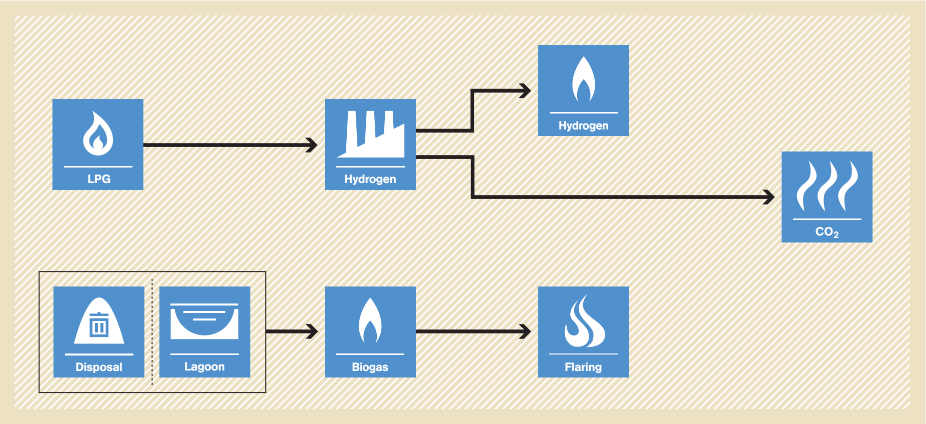
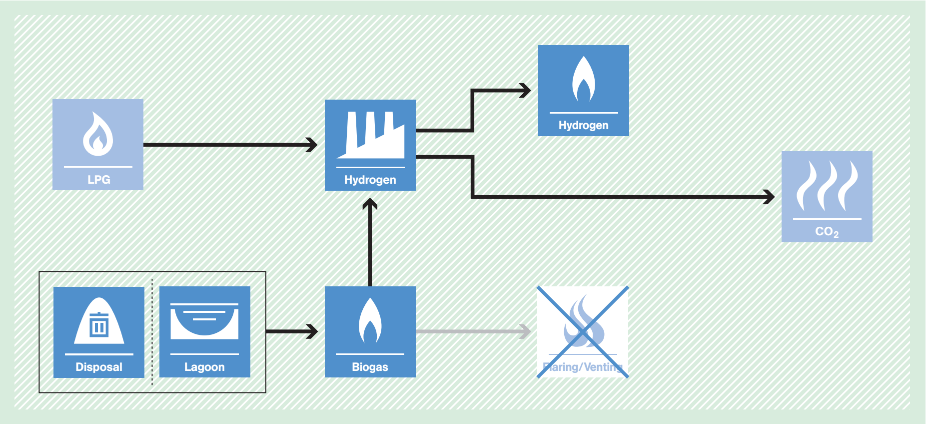
PROJECT SCENARIO
Caustic soda is recovered from black liquor to displace equivalent quantity of purchased caustic soda. Less electricity is required for recovery.



AMS-III.N. Avoidance of HFC emissions in poly urethane foam (PUF) manufacturing

Typical project(s)	Use of a non-GHG blowing agent (e.g. pentane) to replace HFC gases used as a blowing agent (e.g. HFC-134a, HFC-152a, HFC-365mfc and HFC-245fa) during the production of PUF in an existing or a new manufacturing facility.
Type of GHG emissions mitigation action	• Feedstock switch. Avoidance of fugitive emissions of HFC gases through the use of a non-GHG blowing agent.
Important conditions under which the methodology is applicable	• In case a project is implemented at an existing facility, only HFC blowing agent was used in PUF production for at least three years prior to the project implementation; • There are no local regulations that constrain the use of HFC and hydrocarbon (e.g. pentane) as blowing agents; • PUF produced with a non-GHG blowing agent will have equivalent or superior insulating properties than the PUF produced using a HFC blowing agent; • Emission reductions can be claimed only for domestically sold PUF and excludes export of the manufactured PUF.
Important parameters	At validation: • The first year and annual losses of HFC blowing agent.
	Monitored: • Total quantity of PUF production (in m^3) on daily basis.
BASELINE SCENARIO Production of PUF using HFC blowing agents.	
PROJECT SCENARIO Production of PUF using pentane blowing agents.	

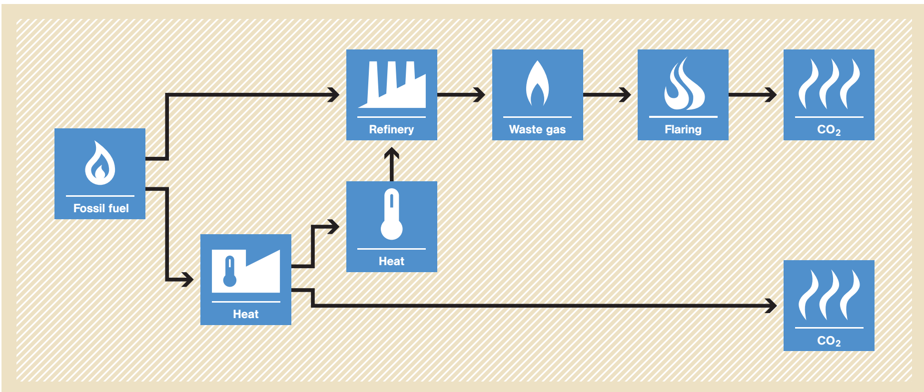
AMS-III.O. Hydrogen production using methane extracted from biogas

Typical project(s)	Installation of biogas purification system to isolate methane from biogas for the production of hydrogen displacing LPG as both feedstock and fuel in a hydrogen production unit. Examples are the installation of a biogas purification system to isolate methane from biogas which is being flared in the baseline situation or installation of a biogas purification system in combination with installation of new measures that recover methane from organic matter from waste water treatment plants or landfills, using technologies/measures covered in AMS III.H. or AMS III.G.
Type of GHG emissions mitigation action	• Fuel and feedstock switch; Fuel and feed stock switch to reduce consumption of fossil fuel.
Important conditions under which the methodology is applicable	• This methodology is not applicable to technologies displacing the production of hydrogen from electrolysis; • The methodology is only applicable if it can be ensured that there is no diversion of biogas that is already being used for thermal or electrical energy generation or utilized in any other (chemical) process in the baseline.
Important parameters	Monitored: • Continuous metering of produced hydrogen on volumetric basis; • Continuous metering of LPG used as feedstock to hydrogen production unit; • Continuous monitoring of specific fuel consumption of LPG when biogas is not available in sufficient quantity; • Continuous measurement of electricity and fuel used by the biogas purification system; • Continuous measurement of biogas produced by the waste water treatment system, landfill gas capture system or other processes producing biogas.
BASELINE SCENARIO LPG is used as feedstock and fuel for hydrogen production.	
PROJECT SCENARIO LPG is displaced by methane extracted from biogas for hydrogen production.	

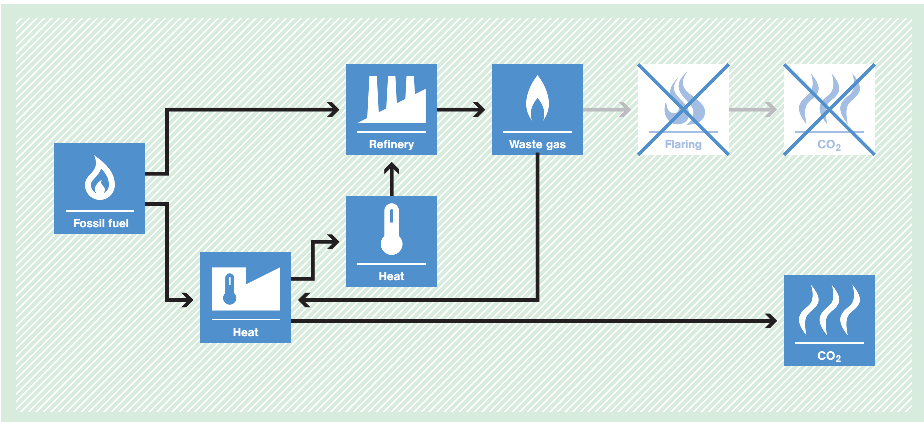
AMS-III.P. Recovery and utilization of waste gas in refinery facilities

Typical project(s)	Implementation of waste gas recovery in an existing refinery, where waste gas is currently being flared, to generate process heat in element process(es).
Type of GHG emissions mitigation action	• Energy efficiency. Displacement of more-GHG-intensive heat production.
Important conditions under which the methodology is applicable	• Proof that the recovered waste gas in the absence of the project was flared (evidence for the last three years). Baseline emissions are capped either at the historical three-year average or its estimation; • Waste gas is not combined with additional fuel gas or refinery gas between recovery and its mixing with a fuel-gas system or its direct use; • The project does not lead to an increase in production capacity of the refinery facility; • The recovery of waste gas may be a new initiative or an incremental gain in an existing practice. If the project is an incremental gain, the difference in the technology before and after implementation of the project should be clearly shown.
Important parameters	At validation: • Historical annual average amount of waste gas sent to flares; • Efficiencies of the process heating device using the recovered waste gas compared to that using fossil fuel.
	Monitored: • Data needed to calculate the emission factors of electrical energy consumed by the project, either from the captive power plant or imported from grid as well as the amount and composition of recovered waste gas (e.g. density, LHV) and data needed to calculate the emission factors from fossil fuels used for process heating and steam generation within the refinery.

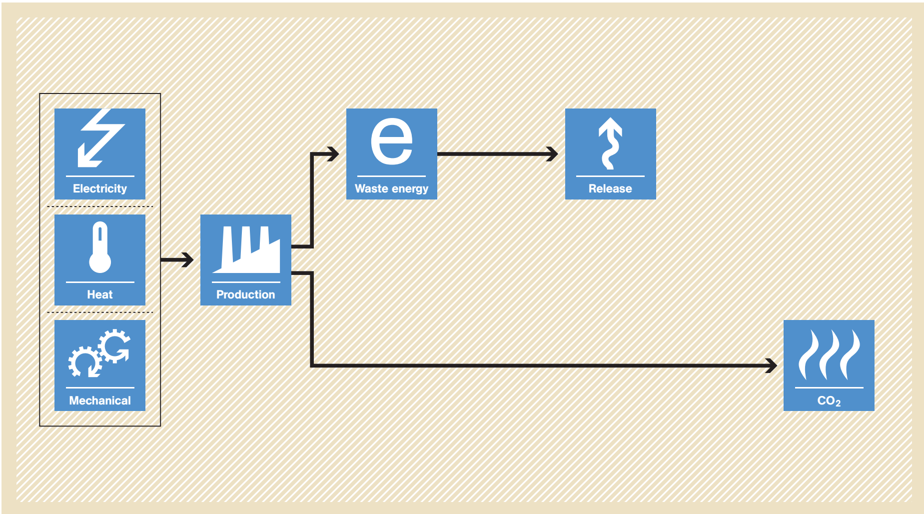
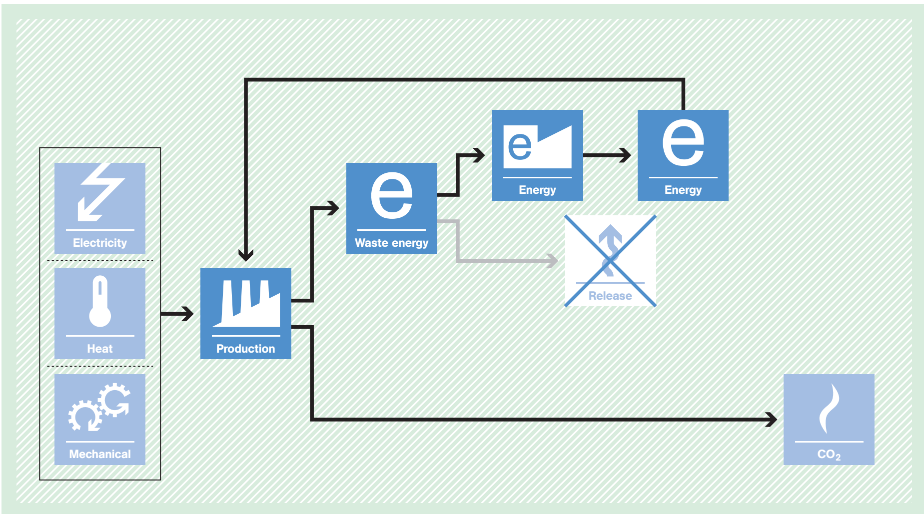
BASELINE SCENARIO
Element process(es) will continue to supply process heat, using fossil fuel. The waste gases from the refinery are flared.



PROJECT SCENARIO
Element process(es) will be fuelled with waste gas, replacing fossil fuel usage.



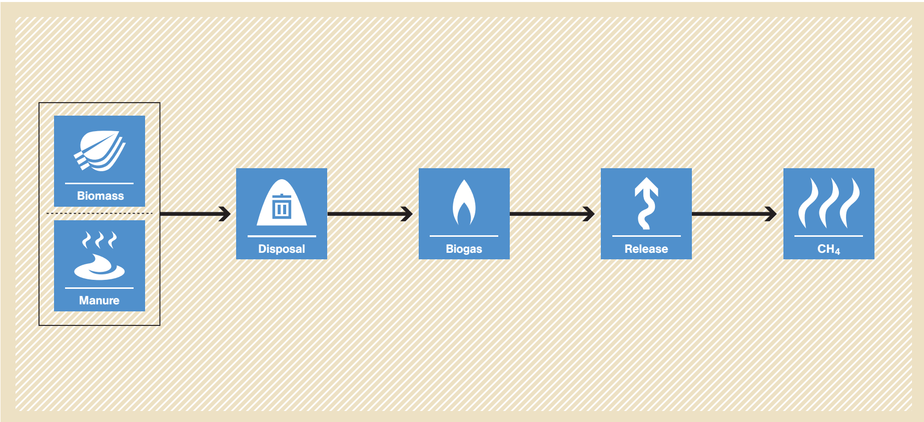
AMS-III.Q. Waste energy recovery (gas/heat/pressure) projects

Typical project(s)	Utilization of waste energy at existing facilities as an energy source for producing electrical/thermal/mechanical energy, including cogeneration.
Type of GHG emissions mitigation action	• Energy efficiency. Reduction of GHG emissions by energy recovery.
Important conditions under which the methodology is applicable	• If the project is implemented at an existing facility, demonstration of the use of waste energy in the absence of the project shall be based on historic information; • It shall be demonstrated that the waste gas/heat or waste pressure utilized in the project would have been flared or released into the atmosphere in the absence of the project.
Important parameters	Monitored: • Thermal/electrical/mechanical energy produced; • Amount of waste gas or the amount of energy contained in the waste heat or waste pressure.
BASELINE SCENARIO Energy is obtained from GHG-intensive energy sources (e.g. electricity is obtained from a specific existing power plant or from the grid, mechanical energy is obtained by electric motors and heat from a fossil-fuel-based element process [e.g. steam boiler, hot water generator, hot air generator, hot oil generator]).	
PROJECT SCENARIO Waste energy is utilized to produce electrical/thermal/mechanical energy to displace GHG-intensive energy sources.	

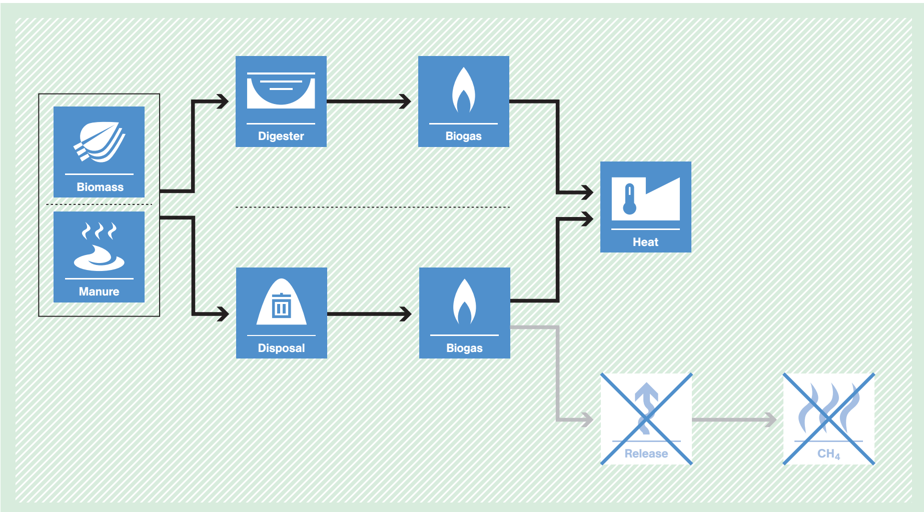
AMS-III.R. Methane recovery in agricultural activities at household/small farm level

Typical project(s)	Recovery and destruction of methane from manure and wastes from agricultural activities through installing methane recovery and combustion system to an existing source of methane emissions or changing the management practice of a organic waste or raw material in order to achieve controlled anaerobic digestion that is equipped with methane recovery and combustion system.
Type of GHG emissions mitigation action	• GHG destruction; • Fuel switch. Destruction of methane emissions and displacement of more-GHG-intensive service.
Important conditions under which the methodology is applicable	• The category is limited to measures at individual households or small farms (e.g. installation of a domestic biogas digester); • Sludge must be handled aerobically; • This project category is only applicable in combination with AMS-I.C.
Important parameters	Monitored: • Number of systems operating; • Average annual hours of operation of a system using survey methods; • Annual average animal population; • Amount of waste/animal manure generated on the farm and the amount of waste/animal manure fed into the system e.g. biogas digester; • Proper soil application (not resulting in methane emissions) of the final sludge verified on a sampling basis.

BASELINE SCENARIO
Biomass and other organic matter are left to decay anaerobically and methane is emitted into the atmosphere.



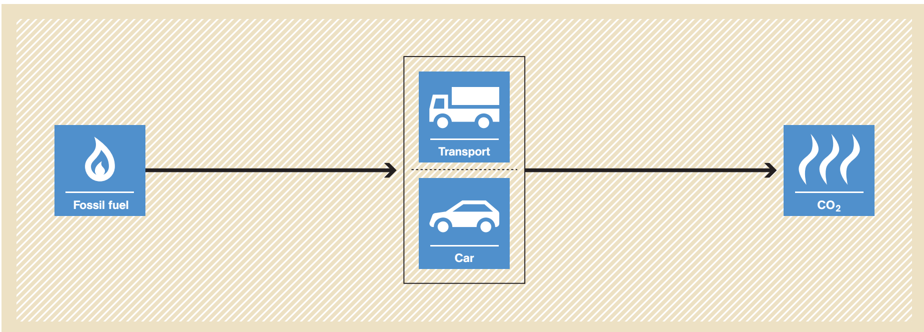
PROJECT SCENARIO
Methane is recovered and destroyed or used. In case of energetic use of biogas, displacement of more-GHG-intensive energy generation.



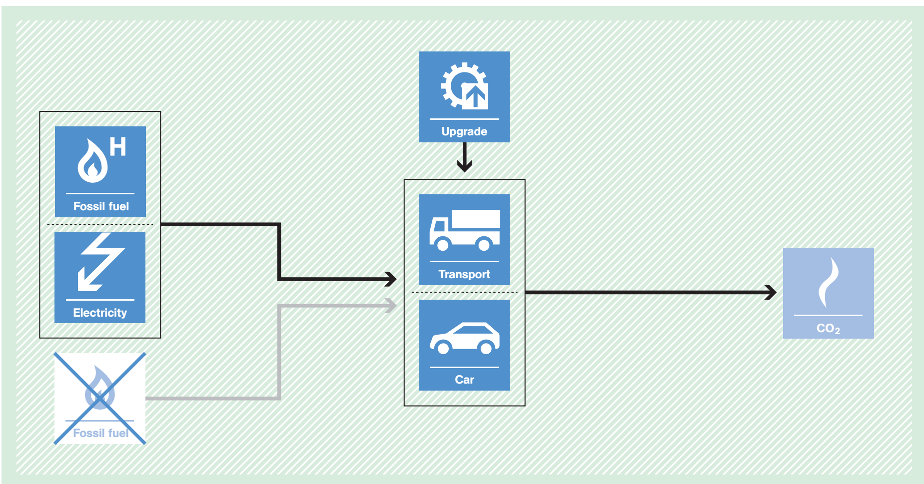
AMS-III.S. Introduction of low-emission vehicles/technologies to commercial vehicle fleets

Typical project(s)	Introduction and operation of new less-greenhouse-gas-emitting vehicles (e.g. CNG, LPG, electric or hybrid) for commercial passengers and freight transport, operating on a number of routes with comparable conditions. Retrofitting of existing vehicles is also applicable.
Type of GHG emissions mitigation action	• Fuel switch. Displacement of more-GHG-intensive vehicles.
Important conditions under which the methodology is applicable	• The level of service provided on each route before project implementation shall remain the same and a modal shift in transport is not eligible; • There is no significant change in tariff discernible from their natural trend, which could lead to change in patterns of vehicle use; • The frequency of operation of the vehicles is not decreased; • The characteristics of the travel route – distance, start and end points and the route itself and/or the capacity introduced by the project is sufficient to service the level of passenger/freight transportation previously provided.
Important parameters	At validation: • Efficiency of baseline vehicles (can also be monitored ex post).
	Monitored: • Total annual distance travelled and passengers or goods transported by project and baseline vehicles on fixed route; • Annual average distance of transportation per person or tonne of freight per baseline and project vehicle; • Service level in terms of total passengers or volume of goods transported on fixed route before and after project implementation.

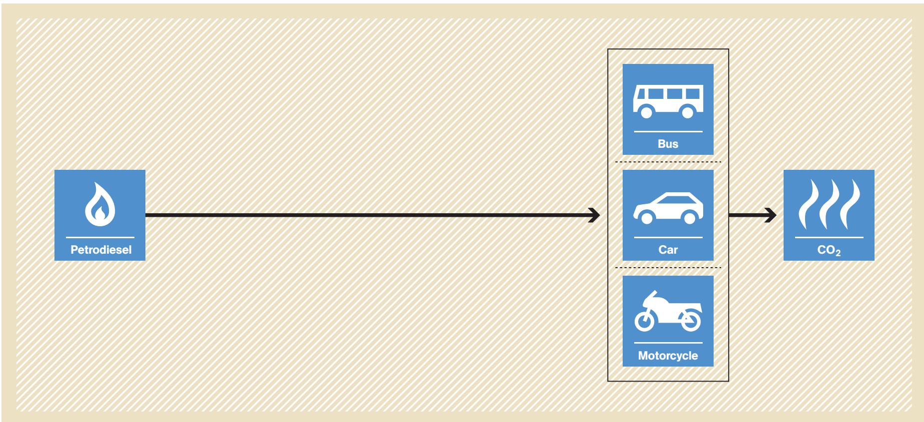
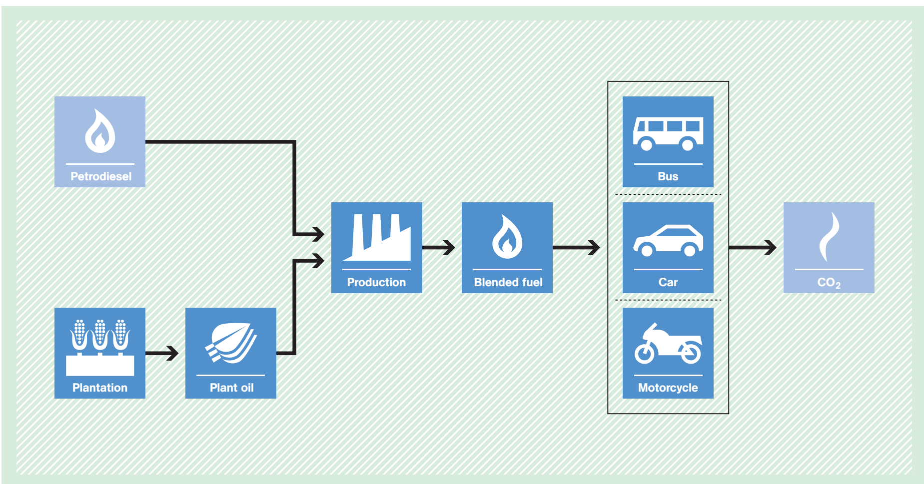
BASELINE SCENARIO
Passengers and freight are transported using more-GHG-intensive transportation modes.



PROJECT SCENARIO
Passengers and freight are transported using new less-greenhouse-gas-emitting vehicles or retrofitted existing vehicles on fixed routes.



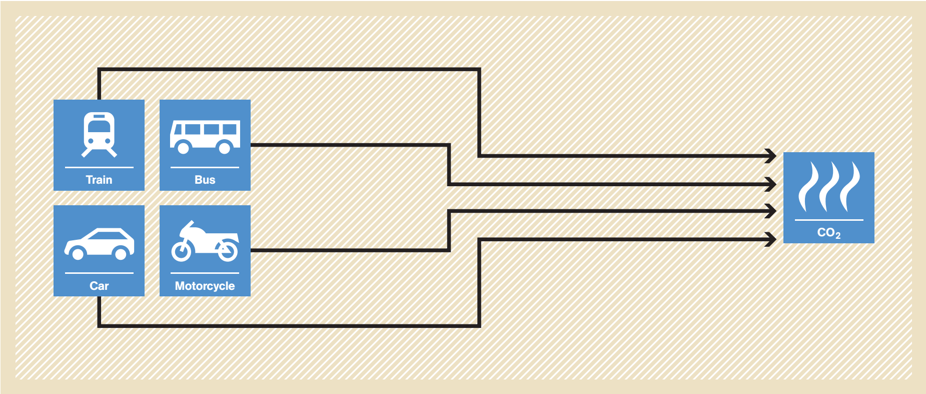
AMS-III.T. Plant oil production and use for transport applications

Typical project(s)	Plant oil production that is used for transportation applications, where the plant oil is produced from pressed and filtered oilseeds from plants that are cultivated on dedicated plantations.
Type of GHG emissions mitigation action	• Fuel switch Displacement of more-GHG-intensive petrodiesel for transport.
Important conditions under which the methodology is applicable	• Oil crops are cultivated on area that is not a forest and has not been deforested during the last 10 years prior to the implementation of the project; • The establishment of dedicated plantations on peatlands is not allowed. • The plant oil is used in blends with pure petrodiesel of up to 10% by volume only or use of pure plant oil in converted vehicles; • Baseline vehicles use petrodiesel only; • No export of produced plant oil to Annex 1 countries allowed.
Important parameters	Monitored: • Crop harvest and oil content of the oilseeds as well as net calorific value and amount of plant oil produced by the project per crop source; • Energy use (electricity and fossil fuel) for the production of plant oil; • Use default values or alternatively monitor amount of fertilizer applied for the cultivation of plant oil per crop source; • Leakage emissions due to a shift of pre-project activities and the competing uses of biomass; • In case of use of pure plant oil it shall be monitored and verified by random sampling that the vehicles have carried out engine conversions.
BASELINE SCENARIO Petrodiesel would be used in the transportation applications.	
PROJECT SCENARIO Oil crops are cultivated, plant oil is produced and used in the transportation applications displacing petrodiesel.	

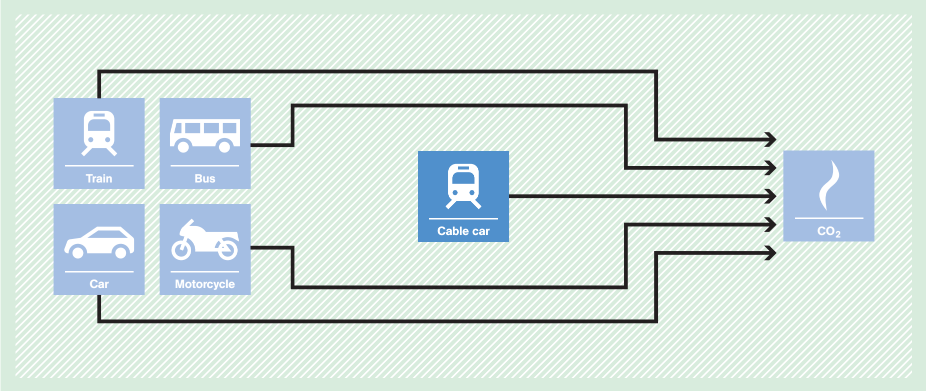
AMS-III.U. Cable Cars for Mass Rapid Transit System (MRTS)

Typical project(s)	Construction and operation of cable cars for urban transport of passengers substituting traditional road-based transport trips. Extensions of existing cable cars are not allowed.
Type of GHG emissions mitigation action	• Energy efficiency; • Fuel switch. Displacement of more-GHG-intensive vehicles.
Important conditions under which the methodology is applicable	• The origin and final destination of the cable cars are accessible by road; • Fuels used in the baseline and/or the project are electricity, gaseous or liquid fossil fuels. If biofuels are used, the baseline and the project emissions should be adjusted accordingly; • The analysis of possible baseline scenario alternatives shall demonstrate that a continuation of the current public transport system is the most plausible baseline scenario.
Important parameters	At validation: • Occupancy rate of vehicles category; • If applicable: grid emission factor (can also be monitored ex post).
	Monitored: • Total passengers transported by the project; • By survey: Trip distance of passengers using the baseline mode and the trip distance of passengers using the project mode from their trip origin to the project entry station and from project exit station to their final destination; • By survey: Share of the passengers that would have used the baseline mode; • Share of the passengers using the project mode from trip origin to the project entry station and from project exit station to their final destination; • Quantity of electricity consumed by the cable car for traction.

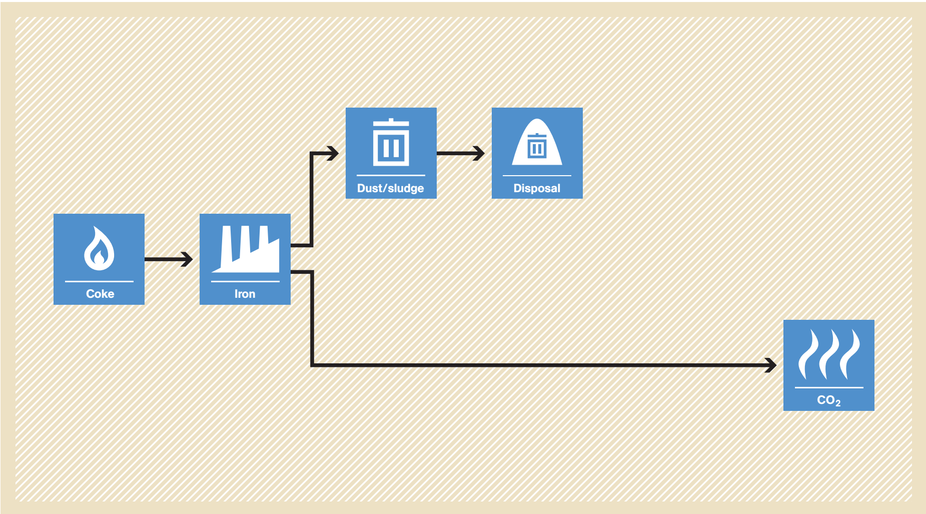
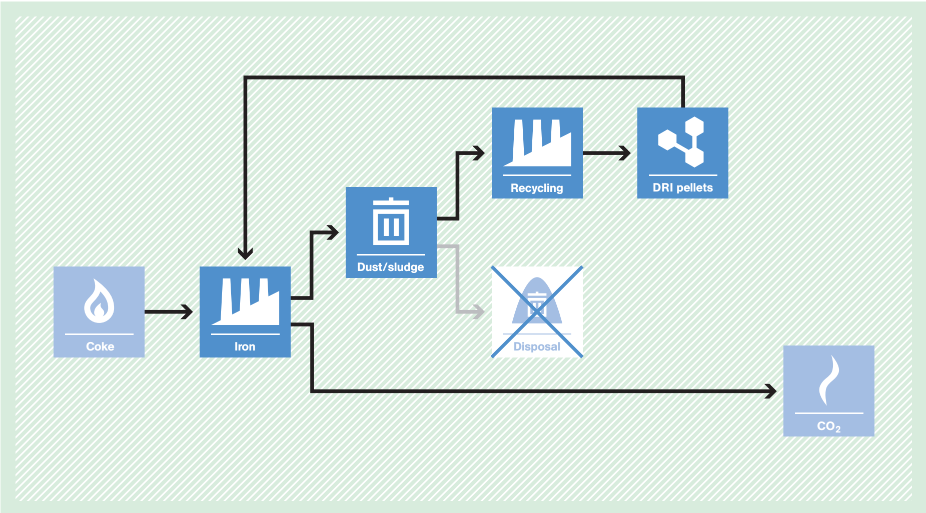
BASELINE SCENARIO
Passengers are transported under mixed traffic conditions using a diverse transport system involving buses, trains, cars, non-motorized transport modes, etc.



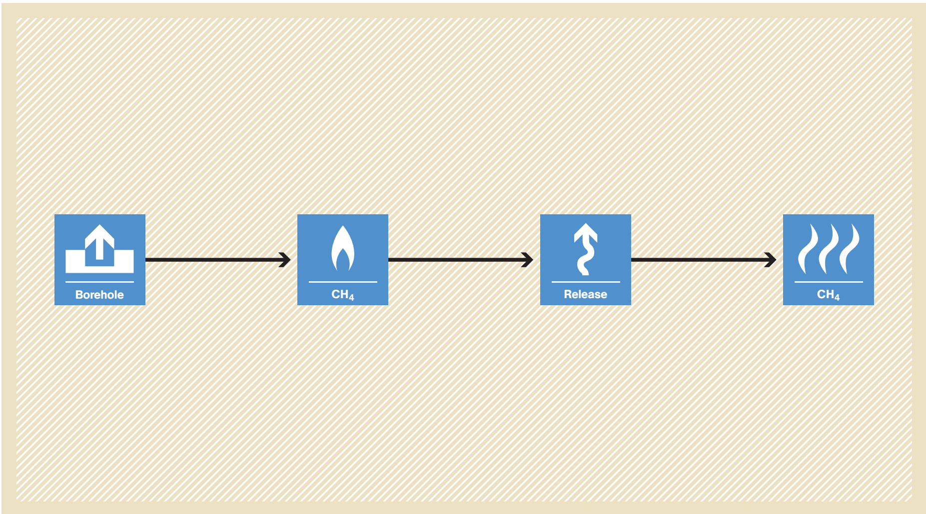
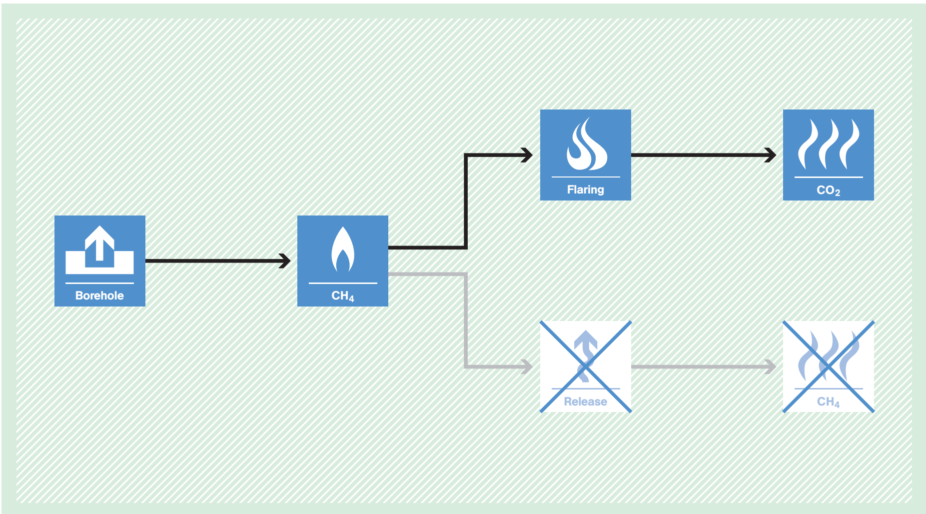
PROJECT SCENARIO
Passengers are transported using cable cars, thus reducing fossil fuel consumption and GHG emissions



AMS-III.V. Decrease of coke consumption in blast furnace by installing dust/sludge recycling system in steel works

Typical project(s)	Introduction of dust/sludge-recycling system such as Rotary Hearth Furnace (RHF), Waelz, and Primus to produce DRI pellet, which is fed into the blast furnace of steel works in order to reduce coke consumption.
Type of GHG emissions mitigation action	• Energy efficiency. Decreased use of coke as reducing agent by recycling dust/sludge in the form of DRI pellets.
Important conditions under which the methodology is applicable	• The dust/sludge is not currently utilized inside the works but sold outside and/or land filled; • "Alternative material" that can be used by the "outside user" instead of the dust/sludge is abundant in the country/region; • Only steel works commissioned before September 26, 2008 are eligible.
Important parameters	At validation: • Historical average of pig iron production and coke consumption.
	Monitored: • Annual quantity of pig iron production, coke consumption; • Quantity and iron content of DRI pellet fed into the blast furnace; • Fuel and electricity use; • Fraction of carbon in coke fed into the blast furnace (tonnes of C per tonne of coke).
BASELINE SCENARIO High amounts of coke are used to produce pig iron, thus leading to high CO_2 emissions. Dust/sludge from steel works is sold to outside user and/or land-filled.	
PROJECT SCENARIO Less coke is used to produce pig iron. This leads to lower CO_2 emissions. Dust/sludge is transformed into DRI pellets which are reused as input in this pigiron production.	

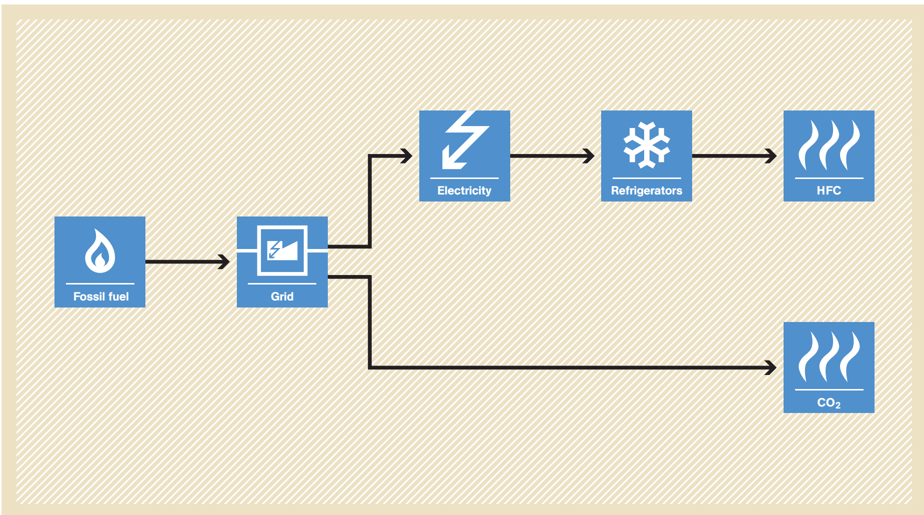
AMS-III.W. Methane capture and destruction in non-hydrocarbon mining activities

Typical project(s)	This methodology comprises activities that capture and destroy methane released from holes drilled into geological formations specifically for mineral exploration and prospecting.
Type of GHG emissions mitigation action	• GHG destruction. Capture and combustion of methane released from boreholes.
Important conditions under which the methodology is applicable	• Abandoned or decommissioned mines, as well as open cast mines are excluded. Coal extraction mines or oil shale, as well as boreholes or wells opened for gas/oil exploration or extraction do not qualify under this methodology; • This methodology is applicable for structures installed, or boreholes drilled before end of 2001, or for structures installed, or boreholes drilled after 2001 but at least five years prior to the submission of the project for validation, where it can be demonstrated that the structures or the boreholes were part of an exploration plan; • This methodology excludes measures that would increase the amount of methane emissions from the boreholes beyond the natural release as would occur in the baseline; • This methodology is not applicable if a combustion facility is used for heat and/or electricity generation.
Important parameters	Monitored: • Amount of methane actually flared; • Consumption of grid electricity and/or fossil fuel by the project.
BASELINE SCENARIO Methane is emitted from boreholes into the atmosphere.	
PROJECT SCENARIO Capture and destruction of methane from boreholes.	

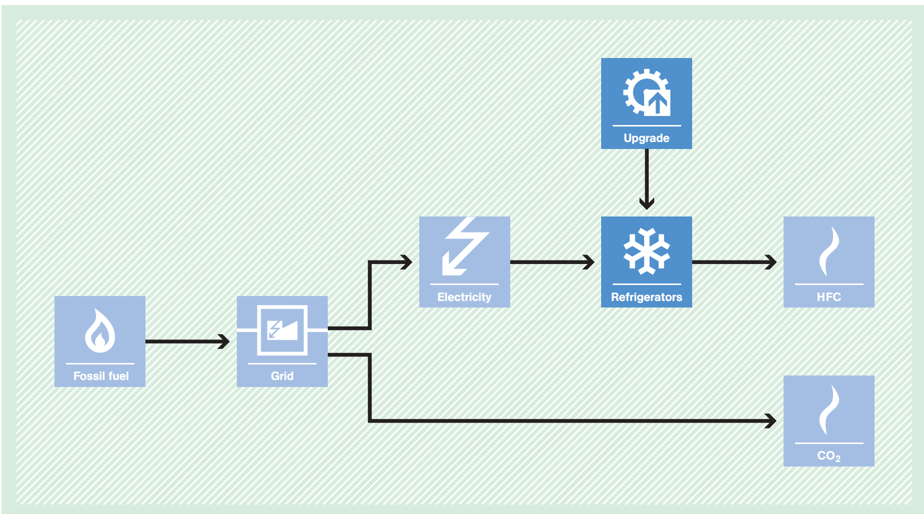
AMS-III.X. Energy efficiency and HFC-134a recovery in residential refrigerators

Typical project(s)	Replacement of existing, functional domestic refrigerators by more-efficient units and recovery/destruction of HFCs from the refrigerant and the foam.
Type of GHG emissions mitigation action	• Energy efficiency; • GHG emission avoidance; • GHG destruction. GHG emission avoidance by re-use of refrigerant or GHG destruction combined with an increase in energy efficiency.
Important conditions under which the methodology is applicable	• Project refrigerants and foam-blowing agents have no ozone depleting potential ozone depleting potential and a global warming potential lower than 15; • All refrigerator replacements take place within just one year of project start; • Project and baseline refrigerators are electrically driven; • Project refrigerators have an average volume capacity of at least 80% of the baseline refrigerators.
Important parameters	Monitored: • Number of refrigerators distributed and their electricity consumption; • Quantity of HFC reclaimed; • Specific electricity consumption from replaced refrigerators.

BASELINE SCENARIO
Use of large amounts of electricity by refrigerators and HFC emissions from the refrigerators.



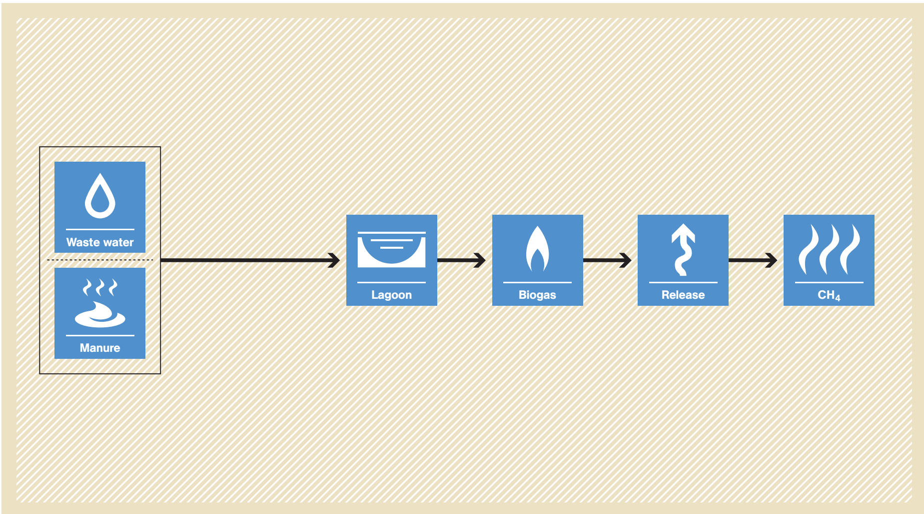
PROJECT SCENARIO
Use of lower amounts of electricity by refrigerators and reduced HFC emissions from refrigerators.



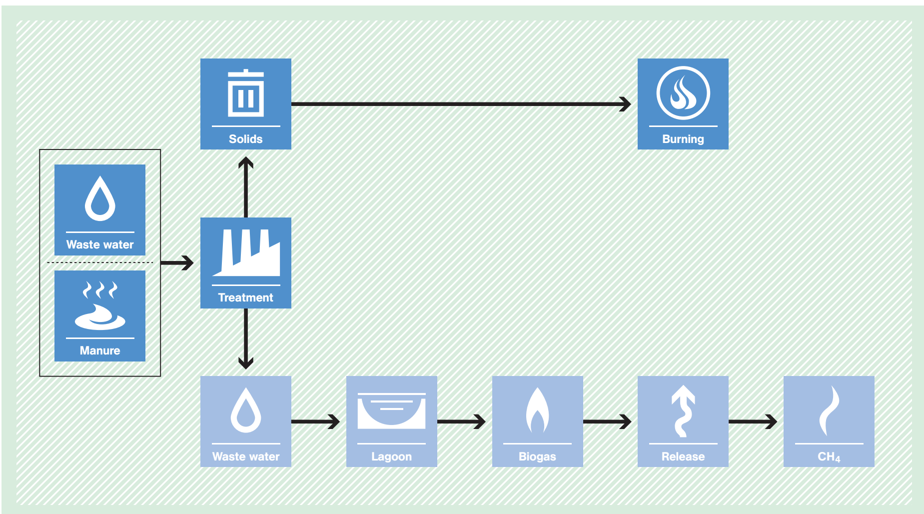
AMS-III.Y. Methane avoidance through separation of solids from wastewater or manure treatment systems

Typical project(s)	Avoidance or reduction of methane production from anaerobic wastewater treatments systems and anaerobic manure management systems where the volatile solids are removed and the separated solids are further treated/used/disposed to result in lower methane emissions.
Type of GHG emissions mitigation action	• GHG emission avoidance. Avoidance of methane emissions.
Important conditions under which the methodology is applicable	• The project does not recover or combust biogas; • Technology for solid separation shall be one or a combination of mechanical solid/liquid separation technologies and thermal treatment technologies, and not by gravity; • Dry matter content of the separated solids shall remain higher than 20% and separation shall be achieved in less than 24 hours; • The liquid fraction from the project solid separation system shall be treated either in a baseline facility or in a treatment system with lower methane conversion factor than the baseline system.
Important parameters	Monitored: • For manure management systems, number of animals, their type and their individual volatile solids excretion; • For wastewater systems, the flow of wastewater entering the system and the COD load of the wastewater.

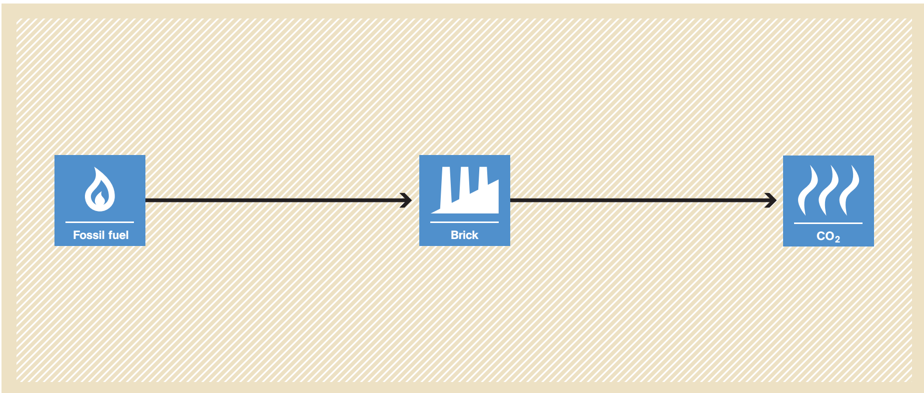
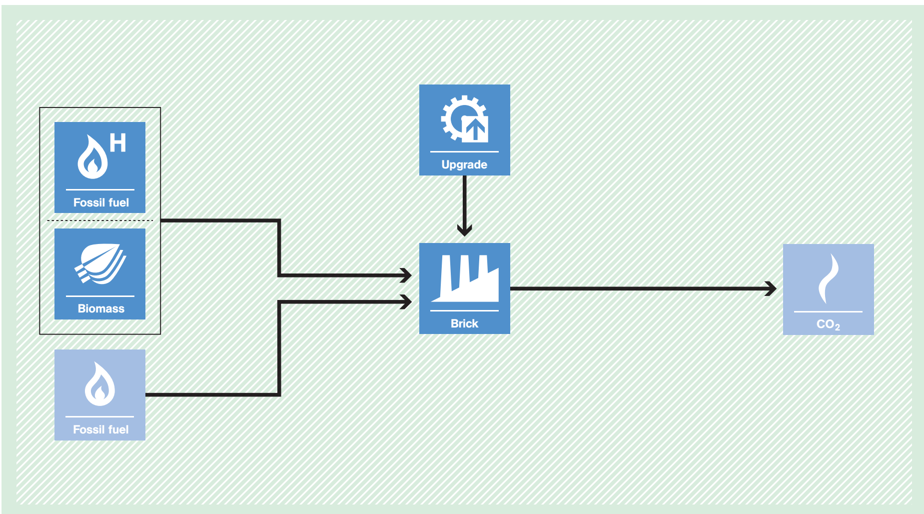
BASELINE SCENARIO
Solids in manure or wastewater would be treated in a manure management system or wastewater treatment facility without methane recover, and methane is emitted into the atmosphere.



PROJECT SCENARIO
Less methane is emitted due to separation and treatment of solids.



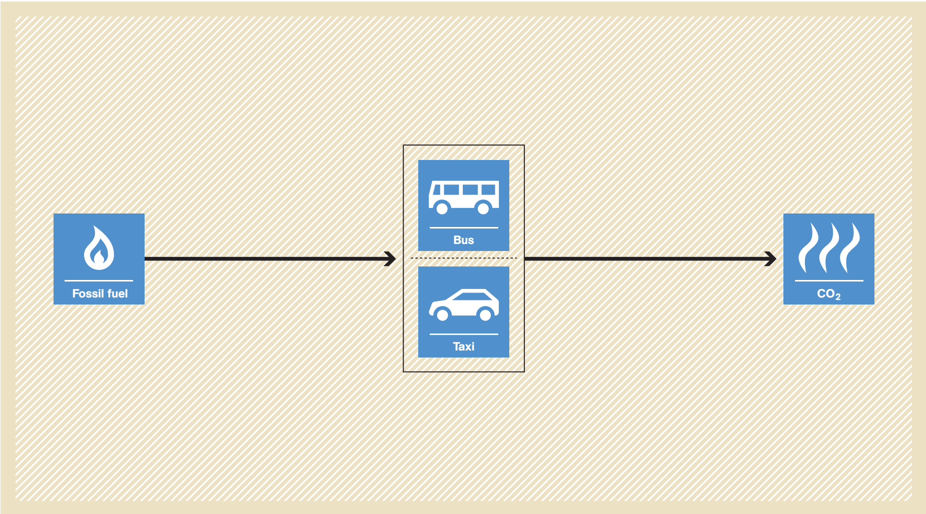
AMS-III.Z. Fuel switch, process improvement and energy efficiency in brick manufacture

Typical project(s)	Switch to a more-energy-efficient brick production process and/or switch from fossil fuel to renewable biomass or less-carbon-intensive fossil fuel.
Type of GHG emissions mitigation action	• Energy efficiency; • Renewable energy; • Fuel switch. Reduction of emissions from decreased energy consumption per brick produced and from the use of fuels with lower carbon intensity, either at an existing brick kiln or at a new facility.
Important conditions under which the methodology is applicable	• Quality of the project bricks should be comparable to or better than the baseline bricks; • No renewable biomass has been used in the existing project facility during the last three years prior to the start of the project; • For project activities involving changes in raw materials the raw materials to be utilized should be abundant in the country/region.
Important parameters	At validation: • Historical brick output and fuel consumption
	Monitored: • Production output; • Quantity and type of fuels used; • Quantity of raw and additive materials; • Quality of the project bricks.
BASELINE SCENARIO Brick production using more-carbon-intensive fuel and energy-intensive technology.	
PROJECT SCENARIO Brick production using less-carbon-intensive fuel or biomass in a more-efficient facility.	

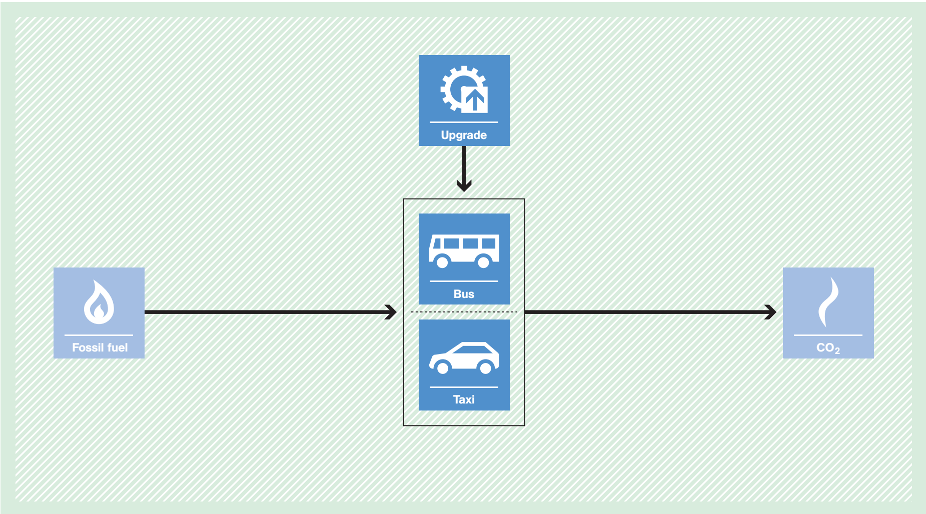
AMS-III.AA. Transportation energy efficiency activities using retrofit technologies

Typical project(s)	Retrofit of the engine of existing/used vehicles for commercial passengers transport (e.g. buses, motorized rickshaws, taxis) which results in increased fuel efficiency of the vehicles.
Type of GHG emissions mitigation action	• Energy efficiency. Energy efficiency measures in transportation reduce GHG emissions due to decreased fuel consumption.
Important conditions under which the methodology is applicable	• The vehicles for passenger transportation are of the same type, use the same fuel and single type of retrofit technology; • The methodology is not applicable to brand new vehicles/technologies (e.g. CNG, LPG, electric or hybrid vehicles); • The vehicles shall operate during the baseline and project on comparable routes with similar traffic situations.
Important parameters	At validation: • Determination of the remaining technical lifetime of the retrofitted vehicles.
	Monitored: • Fuel efficiency of the baseline and project vehicle; • Annual average distance travelled by project vehicles; • Number of theoretically operating project vehicles; • Share of project vehicles in operation.

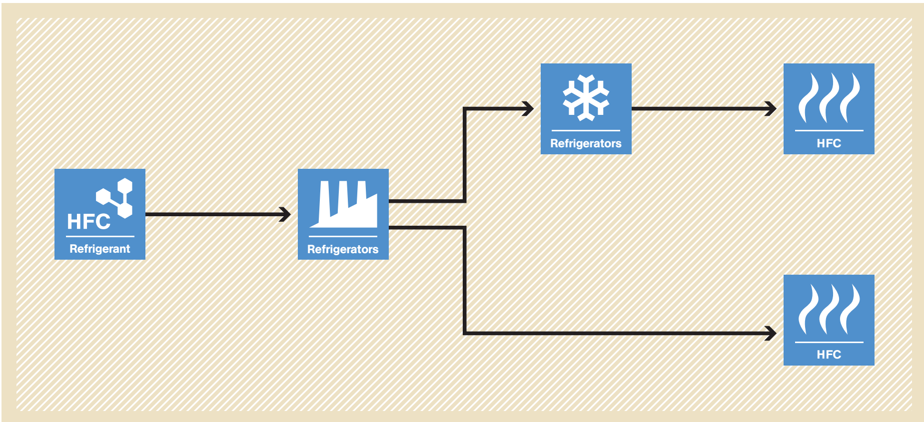
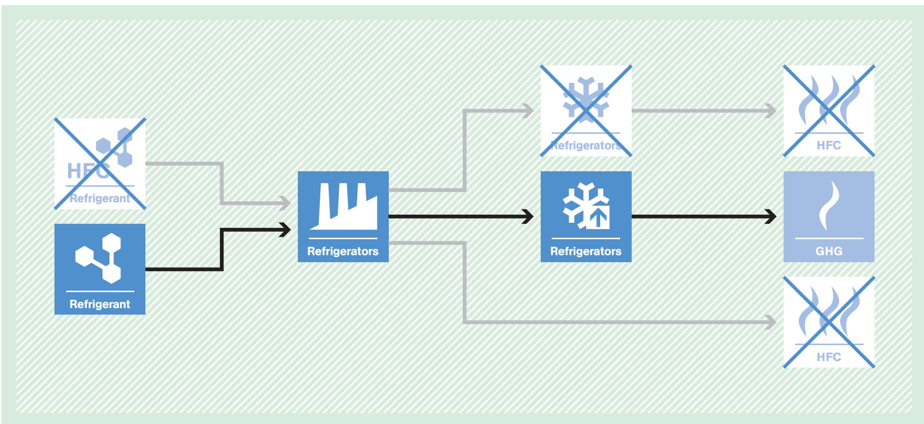
BASELINE SCENARIO
Passengers are transported using less-fuel-efficient vehicles.



PROJECT SCENARIO
Passengers are transported using retrofitted more-fuel-efficient vehicles



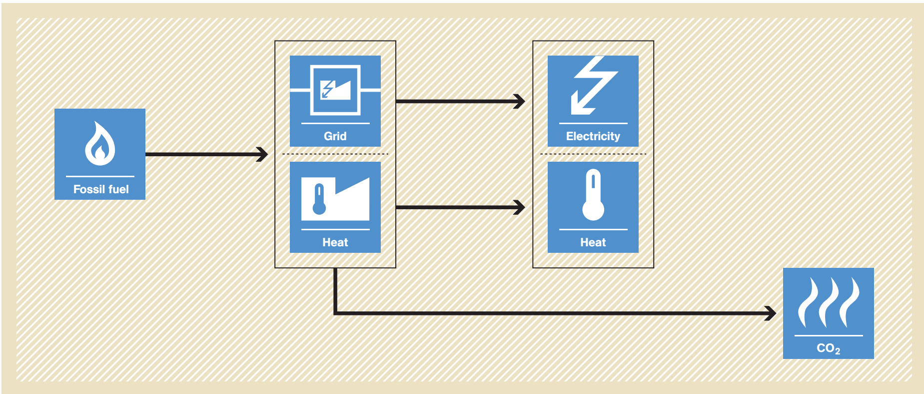
AMS-III.AB. Avoidance of HFC emissions in standalone commercial refrigeration cabinets

Typical project(s)	Introduction of new commercial standalone refrigeration cabinets using refrigerants with low GWP.
Type of GHG emissions mitigation action	• GHG emission avoidance; • Feedstock switch. Avoidance of fugitive emissions of refrigerants with high GWP (e.g. HFC-134a) through the use of refrigerants with low GWP.
Important conditions under which the methodology is applicable	• Cabinets in the project case utilize one type of refrigerants and foam blowing agents having no ODP and low GWP; • The cabinets introduced by the project are equally or more energy efficient than the cabinets that would have been used in the absence of project; • The project proponent has been producing or managing commercial refrigeration cabinets charged with refrigerants with high GWP for at least three years and has not been using refrigerants with a low GWP in significant quantities prior to the start of the project.
Important parameters	At validation: • Nameplate initial refrigerant charge for each refrigeration cabinet model; • Fugitive emissions of refrigerants during manufacturing, servicing/maintenance, and disposal of refrigeration cabinets.
	Monitored: • Number of refrigeration cabinets that are manufactured, put into use, under servicing/maintenance, and decommissioned and disposed.
BASELINE SCENARIO Fugitive HFC emissions with high GWP during manufacturing, usage and servicing, and disposal of refrigeration cabinets.	
PROJECT SCENARIO Fugitive emissions of refrigerants with low GWP during manufacturing, usage and servicing, and disposal of refrigeration cabinets.	

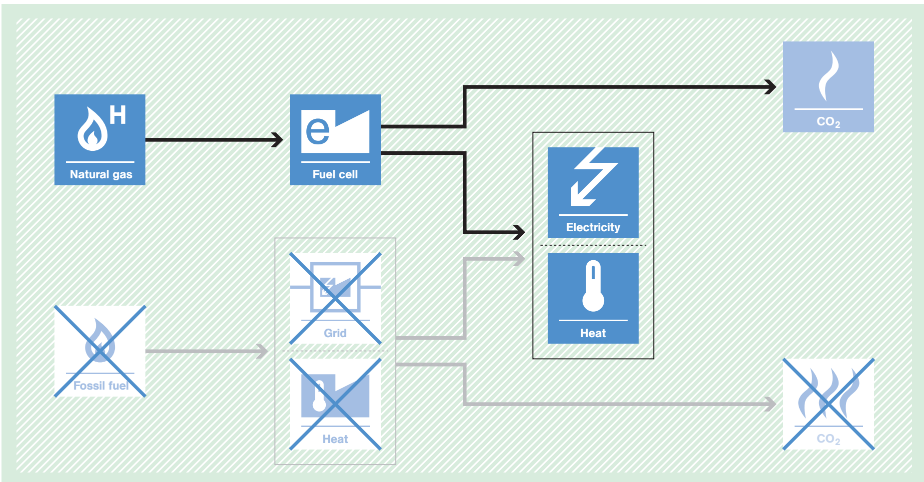
AMS-III.AC. Electricity and/or heat generation using fuel cell

Typical project(s)	Generation of electricity and/or heat using fuel cell technology using natural gas as feedstock to supply electricity to existing or new users or to a grid.
Type of GHG emissions mitigation action	• Energy efficiency. Displacement of more-GHG-intensive electricity or electricity and heat generation.
Important conditions under which the methodology is applicable	• Not applicable where energy produced by fuel cell is used for transportation application; • Electricity and/or steam/heat delivered to several facilities require a contract specifying that only the facility generating the energy can claim CERs; • Natural gas is sufficiently available in the region or country; • If the project includes the replacement of the cell or any part of it (the molten carbonate, the electrodes, etc.) during the crediting period, there shall be no significant changes in the efficiency or capacity of the fuel cell technology used in the project due to the replacement. The lifetime of the fuel cell shall be assessed in accordance with the procedures described in General Guideline to SSC methodologies.
Important parameters	At validation: • If applicable: grid emission factor (can also be monitored ex post).
	Monitored: • Monitoring of energy (heat/power) generation and consumption of the project; • Consumption and composition of feedstock (e.g. natural gas) used for hydrogen production.

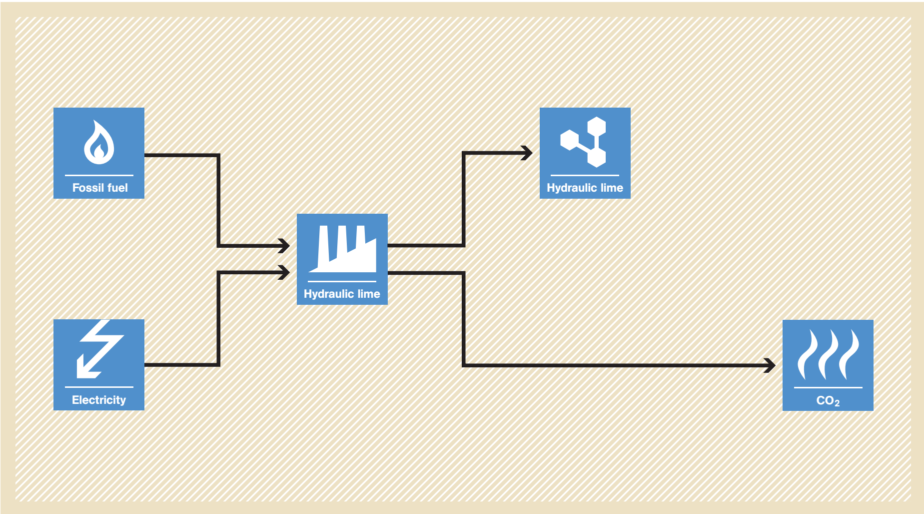
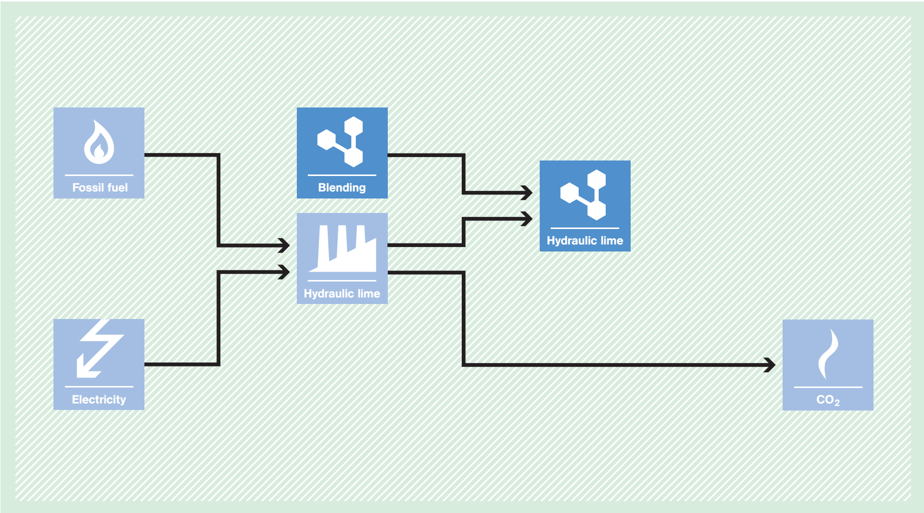
BASELINE SCENARIO
Other technologies that would have been used in absence of the project and/or grid imports are supplying electricity and/or heat to new users or to a grid.



PROJECT SCENARIO
Natural gas as feedstock is used for hydrogen production which is then used in a fuel cell technology to produce heat/electricity displacing alternative technologies and therefore reducing baseline emissions.



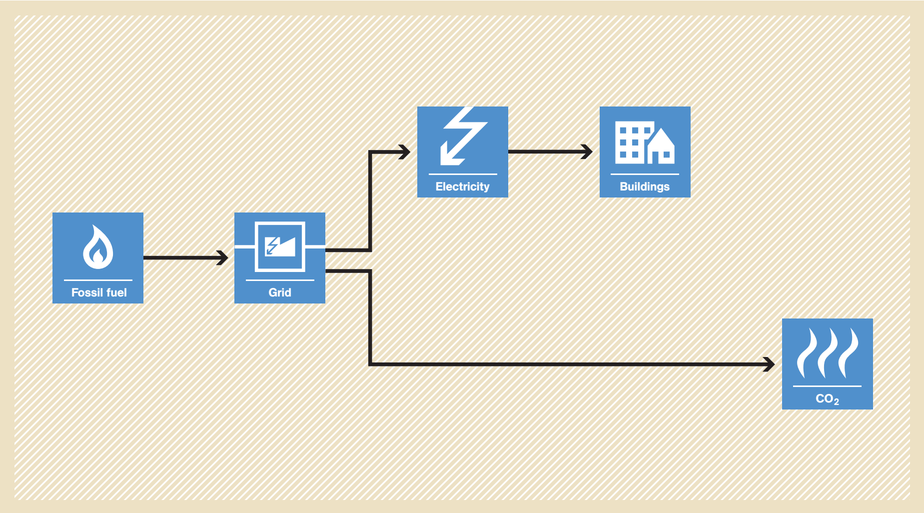
AMS-III.AD. Emission reductions in hydraulic lime production

Typical project(s)	Production of alternative hydraulic lime for construction purposes by blending a certain amount of conventional hydraulic lime with alternative material and additives.
Type of GHG emissions mitigation action	• Feedstock switch. Reduction of production of hydraulic lime and thereby reduction of fossil fuel use and electricity consumption during the production process.
Important conditions under which the methodology is applicable	• Quality of alternative hydraulic lime is the same or better than the hydraulic lime; • There is no other allocation or use for the amount of alternative material used by the project and there is sufficient availability; • The project is in an existing plant; • This methodology is limited to domestically sold output of the project plant and excludes export of alternative hydraulic lime.
Important parameters	• Alternative hydraulic lime meets or exceeds the quality standards of the baseline hydraulic lime; • Total production of alternative lime and hydraulic lime (intermediate product) consumption of alternative lime and additives; • Fuel and electricity consumption.
BASELINE SCENARIO Production of hydraulic lime using conventional process consuming high amount of energy.	
PROJECT SCENARIO Reduced fossil fuel input in hydraulic lime production due to blending with additives.	

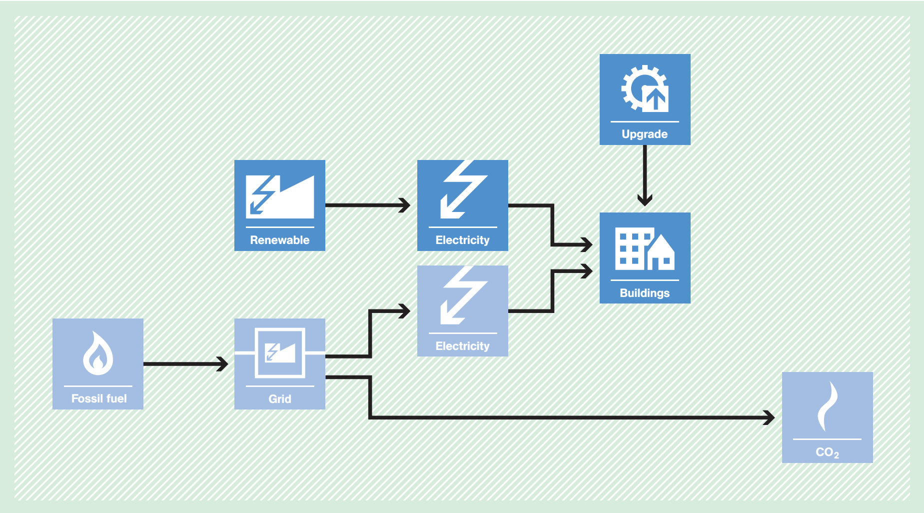
AMS-III.AE. Energy efficiency and renewable energy measures in new residential buildings

Typical project(s)	Installation of energy efficiency and optional renewable power generation measures in new, grid-connected residential buildings.
Type of GHG emissions mitigation action	• Energy efficiency; • Renewable energy. Electricity savings through energy efficiency improvement and optional use of renewable power.
Important conditions under which the methodology is applicable	• Emission reductions shall only be claimed for grid electricity savings; • Emission reductions through biomass energy supply cannot be claimed; • Project buildings must be newly constructed residential buildings, and shall not use fossil or biomass fuels for space heating or cooling; • Refrigerant used in energy-efficient equipment under the project, if any, shall be CFC-free.
Important parameters	At validation: • Monthly electricity consumption of baseline and project residences; • Grid emission factor (can also be monitored ex post); • Monthly HDD and CDD for baseline and project residences; • Baseline and project residence characteristics.
	Monitored: • Update of the parameters provided for validation; • Annual records of project residence occupancy.

BASELINE SCENARIO
Less-efficient use of electricity in buildings.



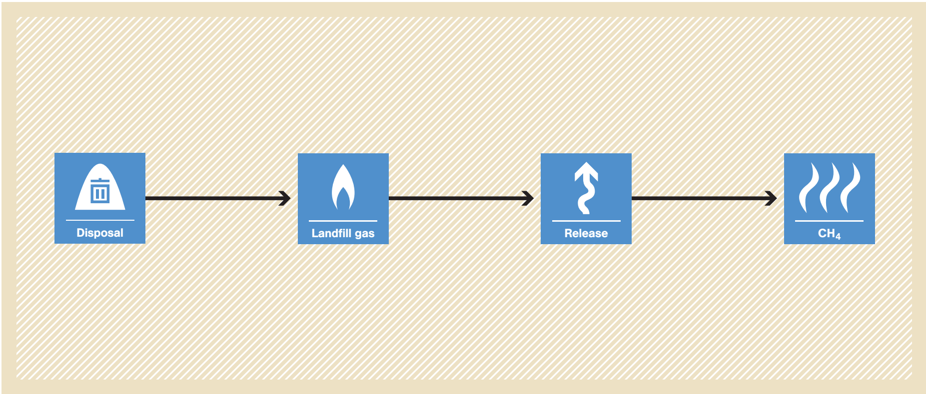
PROJECT SCENARIO
More-efficient use of electricity and optional use of renewable power in buildings.



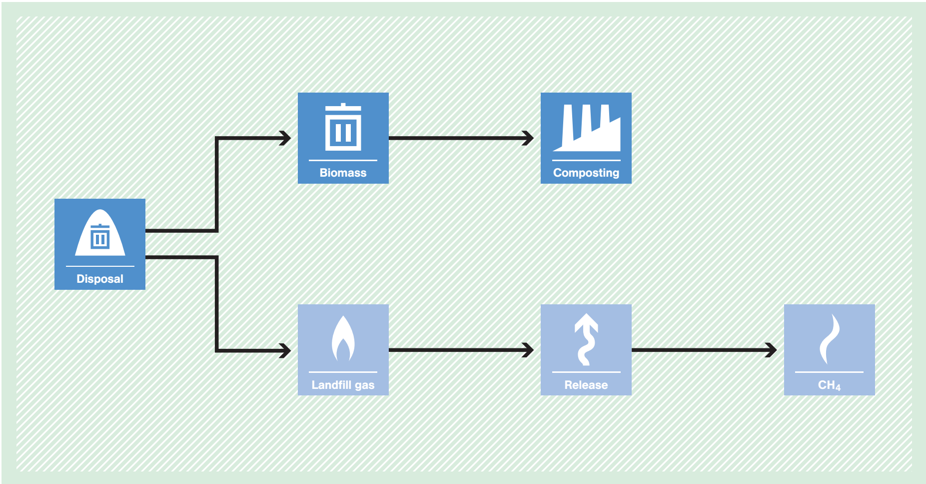
AMS-III.AF. Avoidance of methane emissions through excavating and composting of partially decayed municipal solid waste (MSW)

Typical project(s)	Avoidance of methane emissions from MSW that is already deposited in a closed solid waste disposal site (SWDS) without methane recovery. Due to the project, non-inert material will be composed through pre-aeration, excavation and separation of the MSW in the closed SWDS, so that methane emissions will be avoided.
Type of GHG emissions mitigation action	• GHG emission avoidance. Methane emissions from anaerobic decay of organic matter in municipal solid waste is avoided by alternative waste treatment (i.e. composting).
Important conditions under which the methodology is applicable	• This methodology is applicable if the aerobic pre-treatment is realized either through high pressure air injection enriched with oxygen (20-40% vol.) or low pressure aeration using ambient air. • The existing regulations do not require the capture and flaring of landfill gas of closed SWDS; • The composting process is realized at enclosed chambers or roofed sites, outdoor composting is not applicable.
Important parameters	Monitored: • Quantity of raw waste removed and quantity of compost produced; • Parameters related to transport, e.g. truck capacity; • Parameters related to methane generation potential of the non-inert fraction of the partially decayed, separated MSW; • Amount of non-inert waste excavated and aerobically composted. • Annual amount of fossil fuel or electricity used to operate the facilities or power auxiliary equipment.

BASELINE SCENARIO
MSW is left to decay within the SWDS and methane is emitted into the atmosphere.



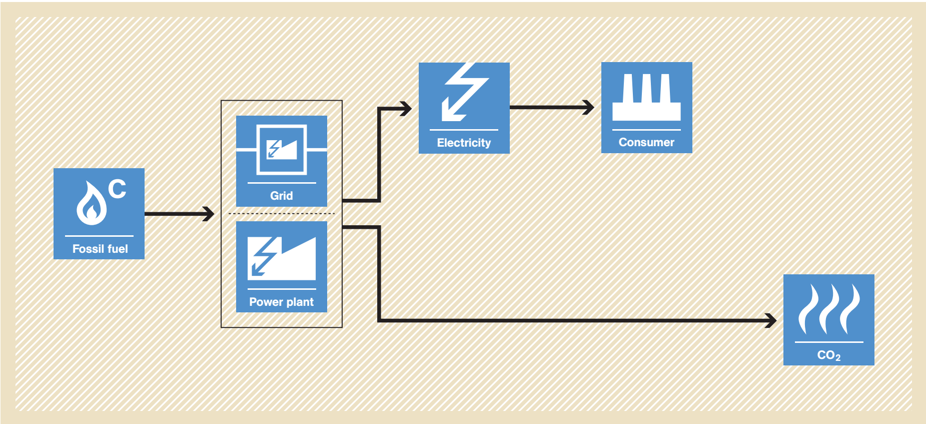
PROJECT SCENARIO
Methane emissions will be avoided by applying pre-aeration and excavation of existing SWDS, followed by separation and composting of non-inert materials.



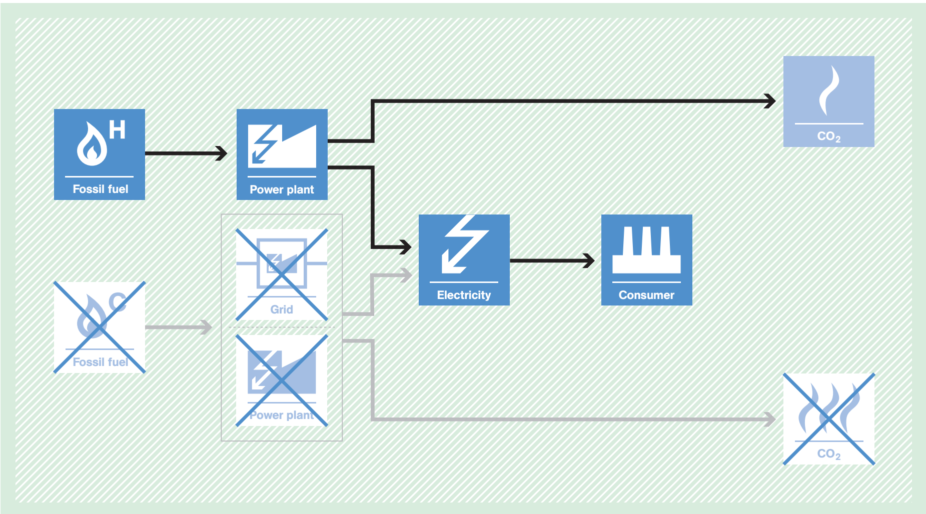
AMS-III.AG. Switching from high carbon intensive grid electricity to low carbon intensive fossil fuel

Typical project(s)	Switch from high carbon grid electricity to electricity generation using less-carbon-intensive fossil fuel such as captive natural-gas-based power generation.
Type of GHG emissions mitigation action	• Fuel switch. Switch to a less-carbon-intensive fuel for power generation.
Important conditions under which the methodology is applicable	• The project is primarily the switch from fossil-fuel-based electricity generation, supplied partly or entirely by the grid, to a single, low-GHG fossil fuel at greenfield or existing facilities; • Cogeneration (e.g. gas turbine with heat recovery) is allowed provided that the emission reductions are claimed only for the electricity output. • Export of electricity to a grid is not part of the project boundary; • Project does not result in integrated process change.
Important parameters	At validation: • Historical power generation for existing baseline plants; • Quantity of fossil fuels for existing baseline plants; • Grid emission factor (alternative monitored).
	Monitored: • Quantity of fossil fuel use; • The output of element process for electricity exported to other facilities shall be monitored in the recipient end.

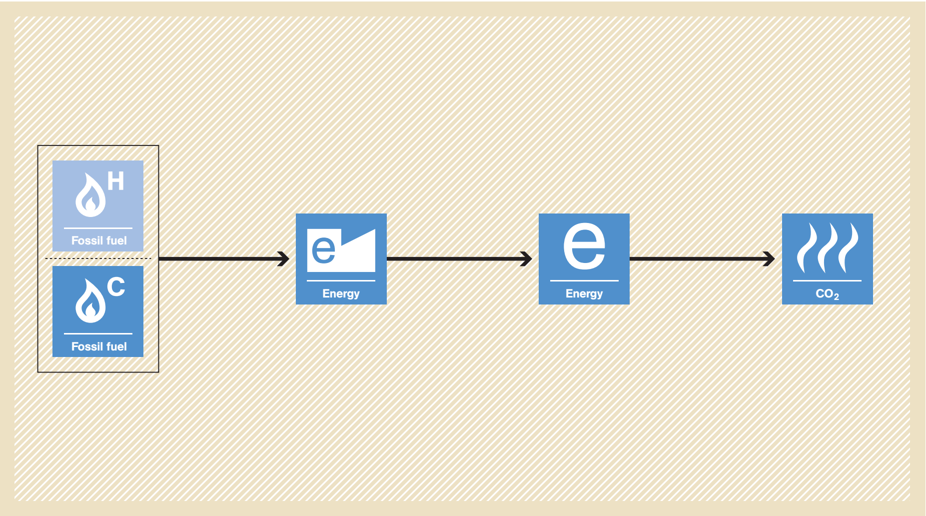
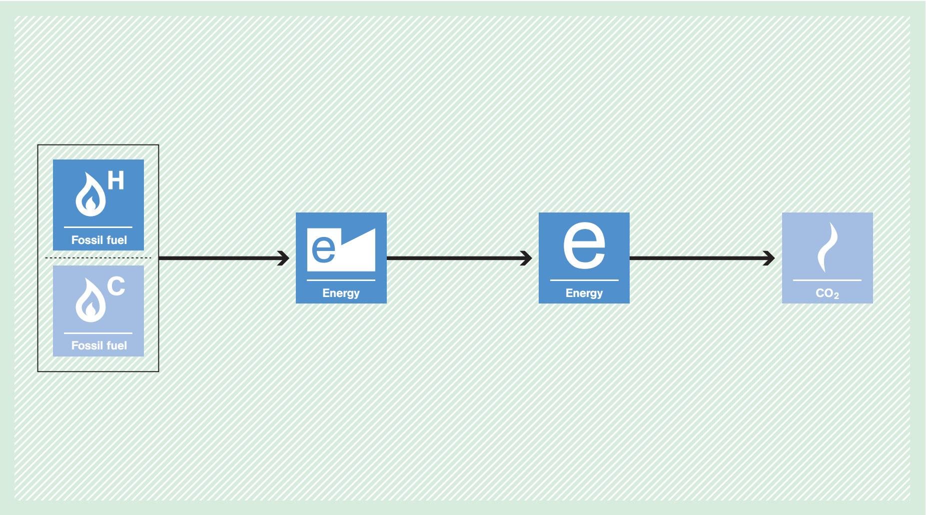
BASELINE SCENARIO
Use of carbon-intensive fuel to generate electricity.



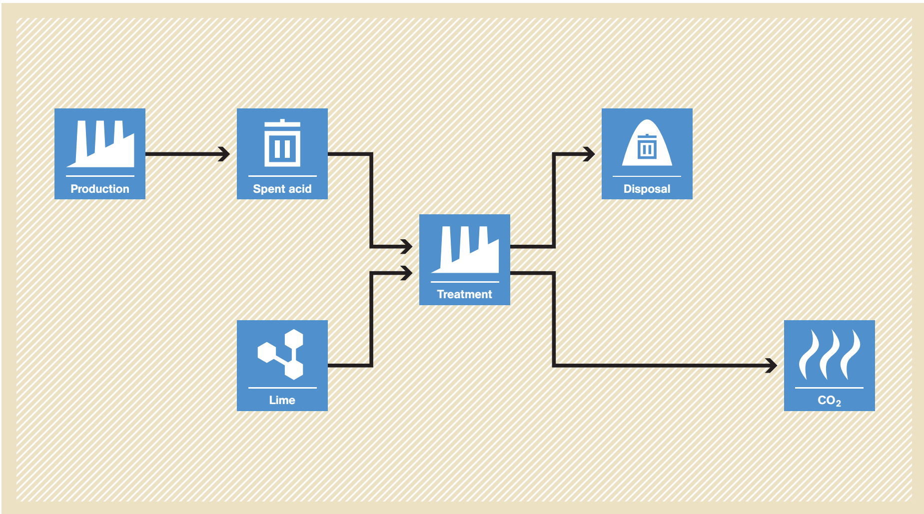
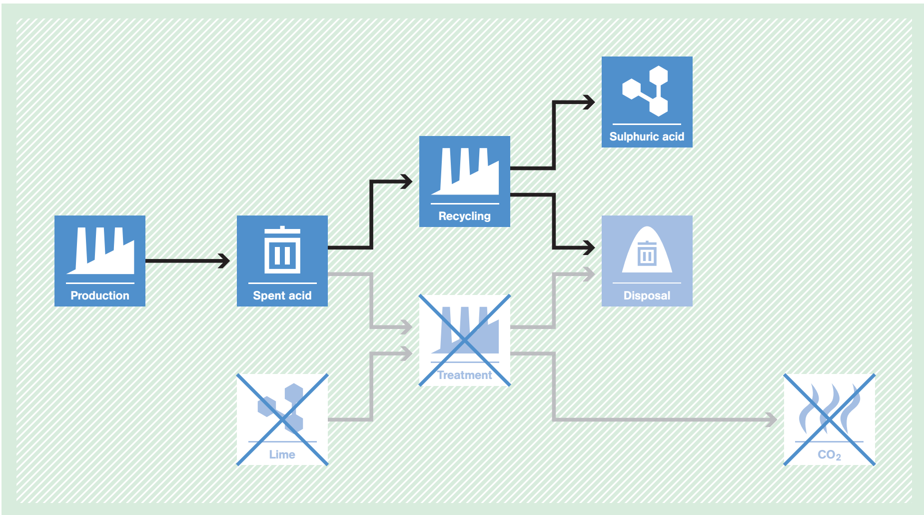
PROJECT SCENARIO
Use of a less-carbon-intensive fuel to generate electricity, which leads to a decrease in GHG emissions.



AMS-III.AH. Shift from high carbon intensive fuel mix ratio to low carbon intensive fuel mix ratio

Typical project(s)	Replacement or retrofit in order to increase the share of less-carbon-intensive fossil fuels in an element process of industrial, residential or commercial applications.
Type of GHG emissions mitigation action	• Fuel switch. Switch to less-carbon-intensive fuel in energy conversion processes.
Important conditions under which the methodology is applicable	• Increase in the share of less-carbon-intensive fuel other than biomass or waste gas/energy; • Only energy efficiency improvements related to the fuel switch are eligible; • Only retrofit and replacements without capacity expansion and/or integrated process change are eligible.
Important parameters	At validation: • Quantity of fossil fuel use; • The output and efficiency of element process (e.g. heat or electricity); • Availability of all baseline fossil fuels. Monitored: • Fossil fuel and energy input to the element process; • Output of the element process and exported to the recipient end.
BASELINE SCENARIO Production of energy using more-carbon-intensive fossil fuel mix.	
PROJECT SCENARIO Production of energy using less-carbon-intensive fossil fuel mix.	

AMS-III.AI. Emission reductions through recovery of spent sulphuric acid

Typical project(s)	Recovery of sulphuric acid from 'spent sulphuric acid' where the neutralization of spent acid with hydrated lime or lime stone and the associated CO_2 emissions in the existing facility are avoided.
Type of GHG emissions mitigation action	• GHG emission avoidance. Avoidance of neutralization of spent acid and of related GHG emissions.
Important conditions under which the methodology is applicable	• The project is a new sulphuric acid recovery facility; • The concentration of the spent sulphuric acid ranges from 18% w/w to 80% w/w (weight percentage); • Specific spent sulphuric acid recovery procedures are applied.
Important parameters	At validation: • Historical data on the quantity of spent sulphuric acid neutralized.
	Monitored: • Quantity and acidity of sulphuric acid recovered; • Historic energy (electricity/steam) self-generated by a neighbouring facility that will be replaced by supply of an equivalent energy by the project; • Energy displaced by the project by supply of energy to a neighbouring facility that displaces an equivalent amount of energy usage in the baseline or supplied to the grid.
BASELINE SCENARIO The spent sulphuric acid is neutralized using hydrated lime, leading to CO_2 emissions.	
PROJECT SCENARIO No hydrated lime is used to neutralize the spent sulphuric acid. The associated CO_2 emissions are avoided.	

AMS-III.AJ. Recovery and recycling of materials from solid wastes

Typical project(s)

HDPE and LDPE plastic materials are recycled from municipal solid wastes (MSW) in a recycling facility and afterwards processed into intermediate or finished products (e.g. plastic pellets, plastic bags).

Type of GHG emissions mitigation action

- Energy efficiency.

Reduction of production of HDPE and LDPE from virgin materials, thus reducing related energy consumption.

Important conditions under which the methodology is applicable

- Recycling process may be accomplished manually and/or using mechanical equipment and includes washing, drying, compaction, shredding and pelletizing of separated LDPE and HDPE;
- Emission reductions can only be claimed for the difference in energy use for the production of HDPE/LDPE products from virgin inputs versus production from recycled material;
- Contractual agreement between recycling facility and manufacturing facility guarantees that only the recycling facility claims CERs;
- Three years historical data show that displaced virgin material is not imported from an Annex I country;
- MSW sources are located within 200 km of the recycling facility. The manufacturing facility is located within 200 km of the recycling facility.

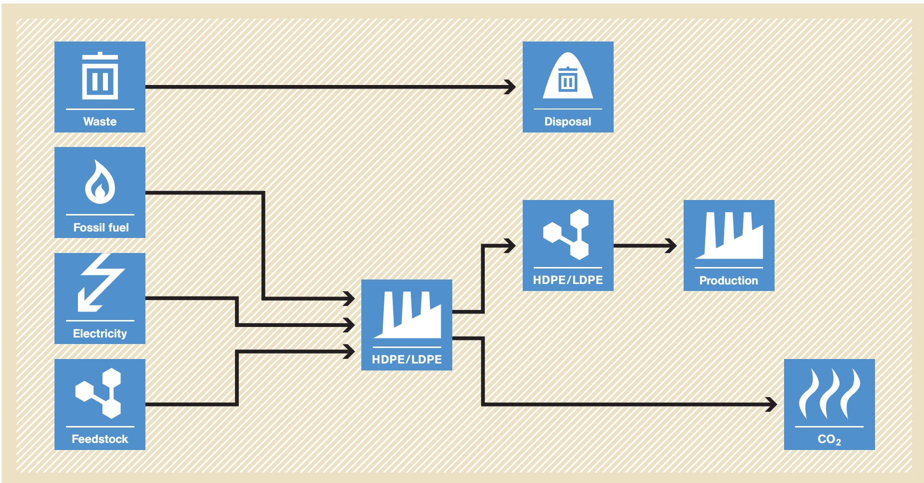
Important parameters

Monitored:

- Quantity of each type of recycled materials sold to a manufacturing facility;
- Electricity and fossil fuel consumption of the recycling facility.

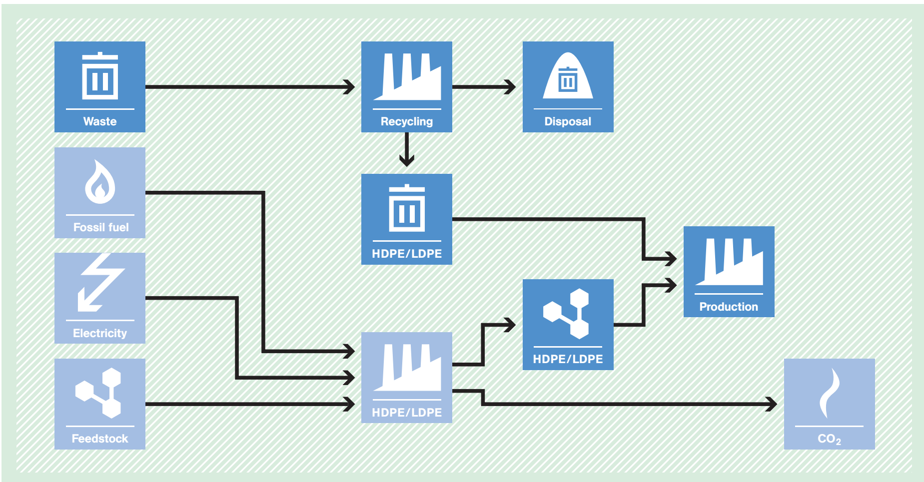
BASELINE SCENARIO

HDPE and LDPE are produced from virgin raw material resulting in high energy consumption.



PROJECT SCENARIO

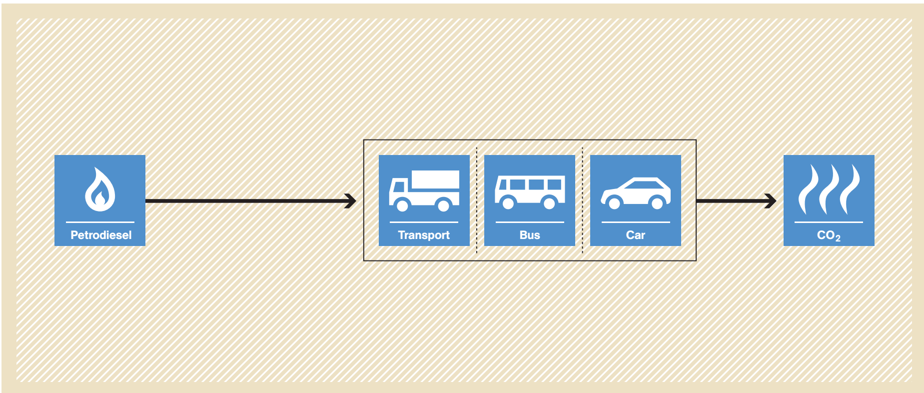
Production of HDPE and LDPE based on virgin raw material is reduced. Use of recycled material results in less energy consumption.



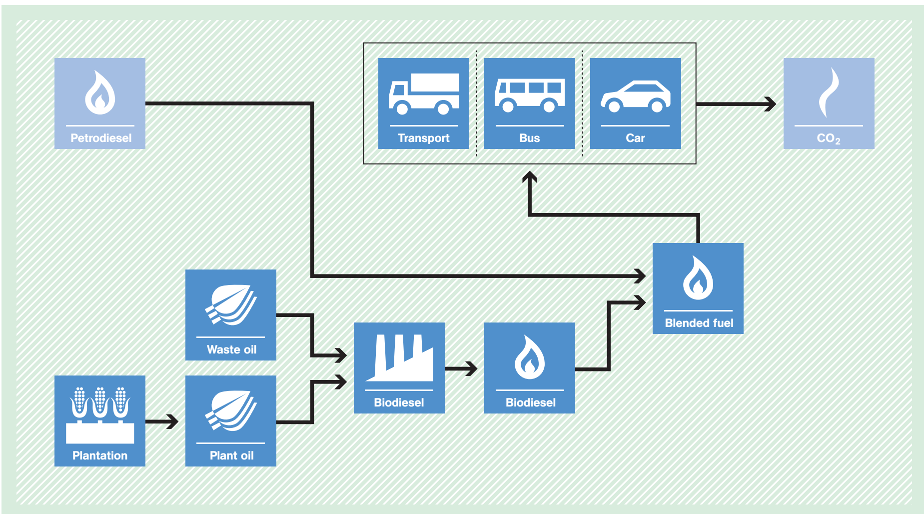
AMS-III.AK. Biodiesel production and use for transport applications

Typical project(s)	Biodiesel production that is used for transportation applications, where the biodiesel is produced from oilseed cultivated on dedicated plantations and from waste oil/fat.
Type of GHG emissions mitigation action	• Renewable energy. Displacement of more-carbon-intensive fossil fuel for combustion in vehicles/ transportation applications by use of renewable biomass.
Important conditions under which the methodology is applicable	• Oil crops are cultivated on area which is classified as degraded or degrading as per the “Tool for the identification of degraded or degrading lands for consideration in implementing CDM A/R project activities” or on area included in the project boundary of one or several registered A/R CDM project activities. Plantations established on peatlands are not eligible; • Export of produced biodiesel is not allowed; • The biodiesel is used in blends with diesel of up to 20 % by volume; • The biodiesel and its blends are end-used in a captive fleet of vehicles; • The alcohol used for esterification is methanol of fossil fuel origin.
Important parameters	Monitored: • Quantity of biodiesel produced in the project plant and consumption of biodiesel and its blends by the captive users; • Quantity of fossil fuel and electricity consumption for processing the oilseeds and the waste fat/oil to produce biodiesel; • Parameters to estimate project emissions from the cultivation of oil crops if the default values for jatropha and palm oil are not applied.

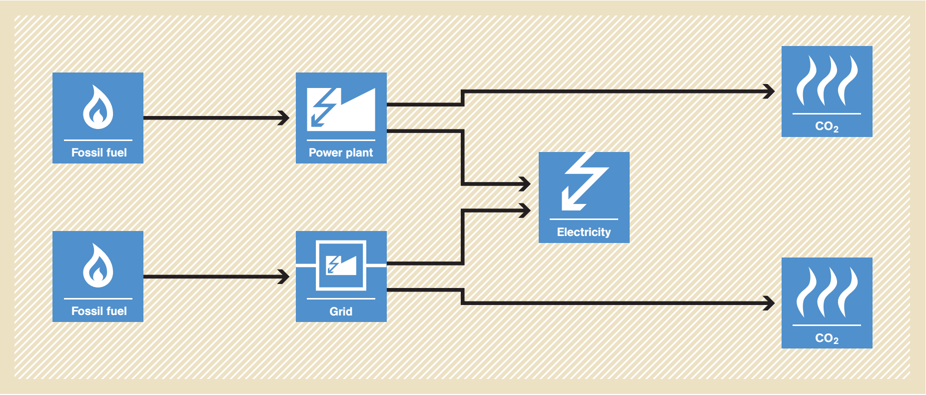
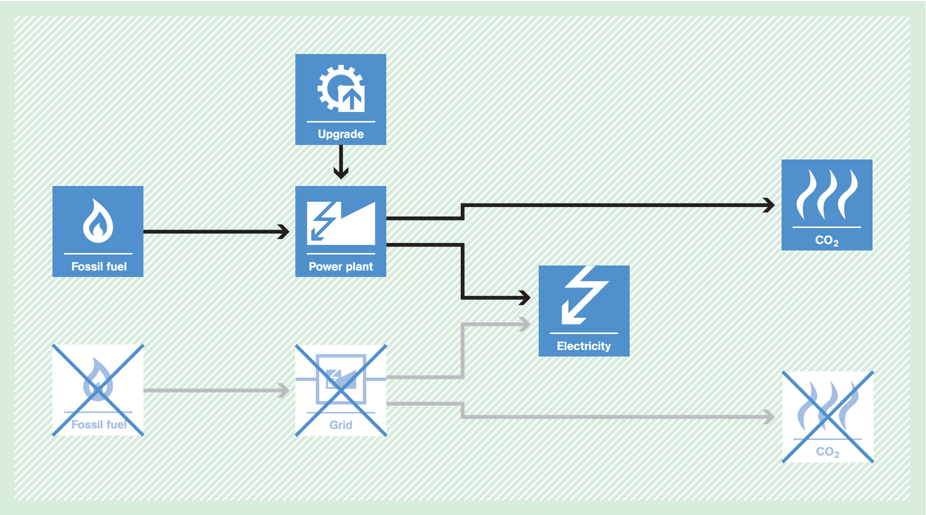
BASELINE SCENARIO
Petrodiesel would be used in the transportation applications.



PROJECT SCENARIO
Oil crops are cultivated, blended biodiesel is produced and used in the transportation applications.



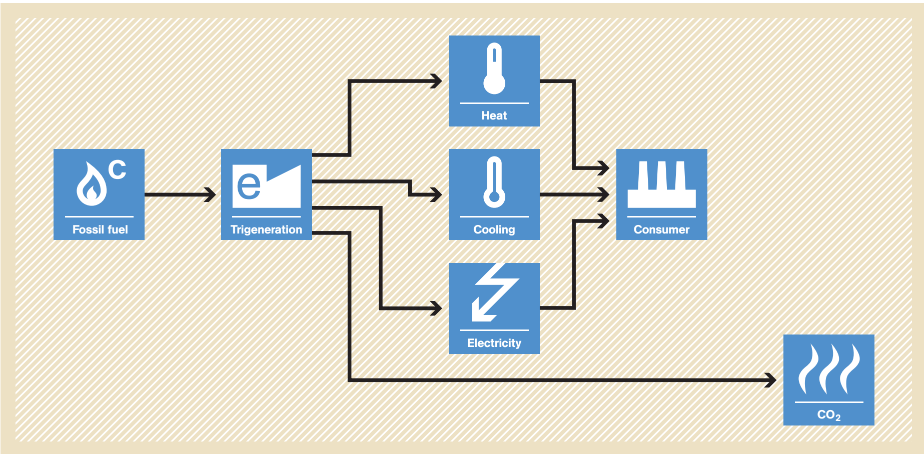
AMS-III.AL. Conversion from single cycle to combined cycle power generation

Typical project(s)	Conversion of an existing single-cycle gas turbine(s) or internal combustion engine(s) with or without cogeneration system to a combined-cycle system with or without cogeneration to produce additional electricity for captive use and/or supply to a grid.
Type of GHG emissions mitigation action	• Energy efficiency. Fuel savings through energy efficiency improvement.
Important conditions under which the methodology is applicable	• The project utilizes excess heat (e.g. gas turbine/engine exhaust heat) that was previously unused for at least three years before the start of the project; • Useful thermal energy produced in the baseline and project is for captive use only; • The project does not involve any major overhauls to the existing single-cycle gas turbine/engine system (no increase of the lifetime or capacity of the system).
Important parameters	At validation: • Emission factor of the grid (can also be monitored ex post); • Average net annual electricity generation of the existing system in the three years immediately prior to the project start; • Average annual fuel consumption of the existing system in the three years immediately prior to the project start.
	Monitored: • Net electricity generated by the project; • Fuel and electricity consumed by the project; • Net thermal energy consumed by the project.
BASELINE SCENARIO Electricity is generated by a single-cycle gas turbine(s)/ engine(s) with or without simultaneous generation of thermal energy (steam or hot water).	
PROJECT SCENARIO The existing single-cycle gas turbine(s) is converted to a combined-cycle gas turbine(s)/ engine(s) for more efficient electricity generation with or without simultaneous generation of thermal energy (steam or hot water).	

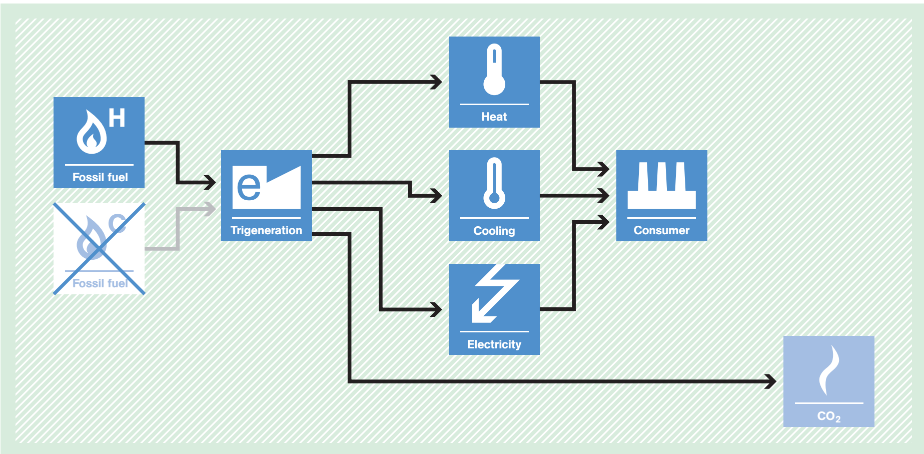
AMS-III.AM. Fossil fuel switch in a cogeneration/trigeneration system

Typical project(s)	Fossil fuel switching from a carbon-intensive fossil fuel to a low-carbon-intensive fossil fuel in a new or existing cogeneration/trigeneration system(e.g. switching from coal to natural gas in a cogeneration/trigeneration unit).
Type of GHG emissions mitigation action	• Fuel switch Displacement of a more-GHG-intensive service.
Important conditions under which the methodology is applicable	• Fuel input efficiency (thermal and electricity output/fuel input) is better (or at least equal) to the baseline one; • Specific auxiliary energy consumption does not change more than +/-10%; • For existing cogeneration/trigeneration systems at least three years of historical data prior to the start of the project (one year if less than three years operational history); • If installations of cooling equipment use refrigerants, such refrigerants must have no or negligible global warming potential (GWP) and no or negligible ozone depleting potential (ODP); • The project does not impact any production processes or other level of service provided.
Important parameters	• Amount of net electricity produced; • Quantity of fossil fuel consumed; • Thermal energy (mass flow, temperature, pressure for heat/cooling) delivered by the project.

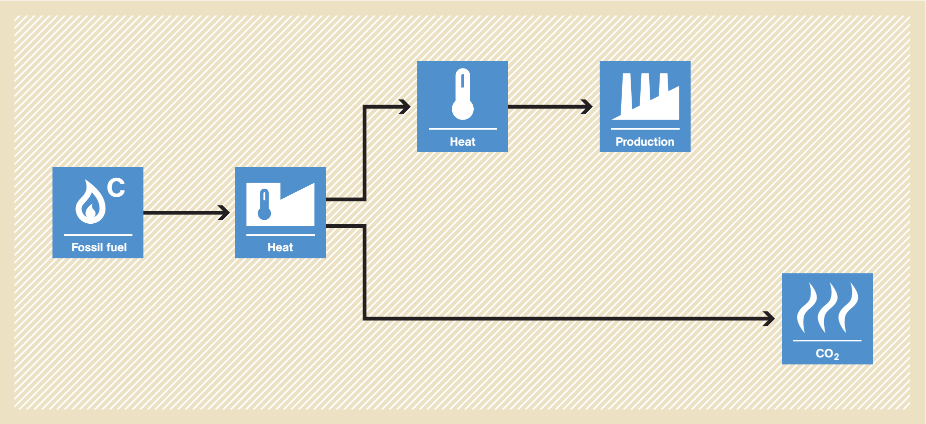
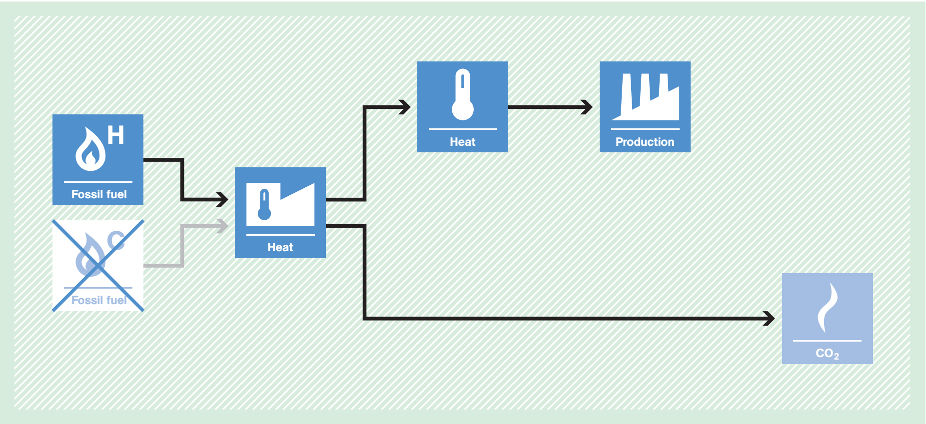
BASELINE SCENARIO
Use of carbon-intensive fossil fuel in cogeneration/trigeneration system for production of power/heat/cooling.



PROJECT SCENARIO
Switch from from carbon-intensive fossil fuel to a low-carbon-intensive fossil fuel in cogeneration/trigeneration system for production of power/heat and cooling.



AMS-III.AN. Fossil fuel switch in existing manufacturing industries

Typical project(s)	Switching from a carbon-intensive fossil fuel to either a less-carbon-intensive fossil fuel or electricity with lower carbon intensity.
Type of GHG emissions mitigation action	• Fuel switch Switch to a fuel/energy source with a lower GHG intensity.
Important conditions under which the methodology is applicable	• The fuel switch occurs at a manufacturing facility with three years of historical data; • The type of inputs and products are equivalent (outputs with same or better service level as compared to the baseline); • The fuel switch at each element manufacturing process is from a single fossil fuel to less-carbon-intensive single fossil fuel or grid electricity; • The fuel switch does not lead to a decrease in energy efficiency; • Elemental process or other down stream/upstream processes do not change as a result of the fossil fuel switch.
Important parameters	At validation: • Quantity of fossil fuel use or amount of the grid electricity consumed; • Baseline raw material consumption and product output.
	Monitored: • Quantity of fossil fuel use or amount of the grid electricity consumed; • The annual net project production of the element process or in cases where product output cannot be measured (e.g. hot/fused metal) annual net project raw material consumption should be monitored.
BASELINE SCENARIO Continued use of a carbon-intensive fossil fuel for the heat generation in a manufacturing process.	
PROJECT SCENARIO Switch of fuel to a less-carbon-intensive fuel or low-carbon grid electricity for the heat generation in a manufacturing process.	

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CLEAN DEVELOPMENT MECHANISM
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Chapter III

METHODOLOGIES FOR AFFORESATION AND REFORESTATION (A/R) CDM PROJECT ACTIVITIES

3.1. INTRODUCTION TO METHODOLOGIES FOR AFFORESTATION AND REFORESTATION (A/R) CDM PROJECT ACTIVITIES

The following conditions and information are relevant for all A/R methodologies and are applicable in addition to the conditions listed in the methodology summaries:

- Vegetation cover on the land eligible for project must have been below the forest threshold[5] for at least 50 years prior to project start (for afforestation projects) or on 31 December 1989 (for reforestation projects). These criteria need to be proven (e.g. satellite image analysis);
- No tree vegetation is expected to form a forest on the project land in the absence of the project;
- Project start must be January 1, 2000 or later.
- In absence of the project, carbon stocks of the carbon pools not considered in the project are expected to decrease or increase less relative to the project scenario.

A/R CDM projects result in t-CERs and l-CERs.

A/R methodologies can be distinguished as large-scale and small-scale. Small-scale A/R methodologies provide simplified approaches for project setup and monitoring. Small-scale A/R projects must fulfil the following conditions:

(1) Net anthropogenic GHG removals by sinks must be less than 16,000 tonnes of CO_2 per year; and
(2) The projects must be developed or implemented by low-income communities and individuals as determined by the host Party.

If the A/R project does not meet these criteria a large scale methodology has to be applied.

[5] The host country determines the forest definition which lies within the following thresholds: A single minimum tree crown cover value between 10 and 30%; and a single minimum land area value between 0.05 and 1 hectare; and a single minimum tree height value between 2 and 5 metres

3.2. METHODOLOGICAL TOOLS FOR AFFORESTATION AND REFORESTATION (A/R) CDM PROJECT ACTIVITIES

A short description of selected methodological tools relevant to A/R methodologies can be found below.

COMBINED TOOL TO IDENTIFY THE BASELINE SCENARIO AND DEMONSTRATE ADDITIONALITY IN A/R CDM PROJECT ACTIVITIES

This tool provides a step-wise approach to identify the baseline scenario and simultaneously demonstrate additionality. These steps include:

Step 0 Preliminary screening based on the starting date of the A/R project;
Step 1 Identification of alternative land use scenarios;
Step 2 Barrier analysis;
Step 3 Investment analysis (if needed);
Step 4 Identification of the baseline scenario
Step 5 Common practice analysis.

This tool is not applicable to small scale projects.

TOOL FOR THE DEMONSTRATION AND ASSESSMENT OF ADDITIONALITY IN A/R CDM PROJECT ACTIVITIES

This tool provides a step-wise approach to demonstrate and assess the additionality of a A/R CDM project. The procedure is also based on five steps, however in a different order:

Step 0 Preliminary screening based on the starting date of the A/R CDM project;
Step 1 Identification of alternative land use scenarios;
Step 2 Investment analysis:
Step 3 Barriers analysis; and
Step 4 Common practice analysis.

This tool is not applicable to small scale project activities.

CALCULATION OF THE NUMBER OF SAMPLE PLOTS FOR MEASUREMENTS WITHIN A/R CDM PROJECT ACTIVITIES

This tool estimates the number of permanent sample plots needed for monitoring changes in carbon pools at a desired precision level. It is applicable if sample plots are used for monitoring purposes and the following condition applies: Variables under consideration are normally distributed or may be transformed into a normal distribution. Normal distribution can be assumed when many small (independent) effects contribute to each observation in an additive fashion.

The tool provides two methodologies to calculate the random number of sample plots, one for samples drawn without replacement (e.g. to measure standing tree dimensions) and one for samples drawn with replacement (e.g. wood or litter removal for laboratory measurements).

TOOL FOR TESTING SIGNIFICANCE OF GHG EMISSIONS IN A/R CDM PROJECT ACTIVITIES

This tool facilitates the determination of significance for GHG emissions by sources, decreases in carbon pools, or leakage emissions for a particular A/R CDM project. It is used to:

(1) Determine which decreases in carbon pools, and increases in emissions of the greenhouse gases that result from the implementation of the A/R project, are insignificant and can be neglected;
(2) Ensure that it is valid to neglect decreases in carbon pools and increases in GHG emissions by sources stated as being insignificant in the applicability conditions of an A/R CDM methodology.

PROCEDURE TO DETERMINE WHEN ACCOUNTING OF THE SOIL ORGANIC CARBON POOL MAY BE CONSERVATIVELY NEGLECTED IN A/R CDM PROJECT ACTIVITIES

This tool provides guidelines and criteria to determine when accounting of the soil organic carbon pool may be conservatively neglected in A/R CDM projects. Where availability of evidence on change in the soil organic carbon pool under land use or land-use change remains limited, a conservative approach has been adopted.

The tool is applicable to those land areas within the project boundary that meet the following conditions:

(1) The areas does not include organic soils (e.g. peatlands), or wetlands;
(2) The rate of loss of carbon stocks in mineral soils due to erosion within the project boundary shall not be permanently increased above baseline rates by the A/R CDM project;
(3) Fine litter (small twigs, bark and leaves) shall remain on site.

TOOL FOR ESTIMATION OF GHG EMISSIONS FROM CLEARING, BURNING AND DECAY OF EXISTING VEGETATION DUE TO IMPLEMENTATION OF A A/R CDM PROJECT ACTIVITY

This tool can be used to estimate the increase in emissions of greenhouse gases due to live woody vegetation existing within the proposed A/R project boundary – the "existing woody vegetation" – being cleared, burned, and/or left to decay as part of activities attributable to the A/R CDM project. The tool applies two steps:

Step 1 Determine if emissions are significant according to the respective A/R CDM guidelines (if not significant, further use of tool is not required).
Step 2 Apply simplified default approaches for estimating increase in GHG emissions for CO_2 and non-CO_2 greenhouse gases.

Note: Effective 4 June 2011, this tool shall be superseded by the A/R tool "Estimation of the increase in GHG emissions attributable to displacement of pre-project agricultural activities in A/R CDM project activity" (EB 51 report, paragraph 40).

TOOL FOR ESTIMATION OF GHG EMISSIONS RELATED TO DISPLACEMENT OF GRAZING ACTIVITIES IN A/R CDM PROJECT ACTIVITY

This tool can be used to estimate GHG emissions measurable and attributable to displacement of grazing activities ("leakage") caused by implementation of an A/R CDM project.

The tool provides an annex with the default values for dry matter intake (DMI) and an equation for the calculation of DMI for livestock types. Further, it provides default values for annual net primary production (ANPP) by IPCC climate zones.

This tool is not applicable if activities are displaced to settlements, wetlands and other lands as defined by the IPCC good practice guidance for forestry (i.e. bare soil, rock, ice, and all unmanaged land areas that do not fall into category of forest land, cropland, grassland, settlements or wetlands).

TOOL FOR ESTIMATION OF CARBON STOCKS, REMOVALS AND EMISSIONS FOR THE DEAD ORGANIC MATTER POOLS DUE TO IMPLEMENTATION OF A A/R CDM PROJECT ACTIVITY

This tool can be used to estimate the carbon stocks, removals and emissions for the dead organic matter (DOM) pools – the dead-wood and litter pools – within the boundary of an A/R CDM project. It provides a simplified methodological approach for estimating DOM carbon stocks and changes, and any associated non-CO_2 emissions, based on conservative default data. An annex gives guidelines and guidance on sources and selection of default data.

The tool considers carbon stocks and changes in:

- DOM existing within the project boundary at the time an A/R project commences: the "existing DOM";
- DOM that results from establishment of forest within the project boundary as part of A/R project activities: the "project DOM".

TOOL FOR THE IDENTIFICATION OF DEGRADED OR DEGRADING LANDS FOR CONSIDERATION IN IMPLEMENTING A/R CDM PROJECT ACTIVITIES

It provides a procedure for the identification of degraded or degrading lands (based on documented evidence of degradation) for the purpose of application of A/R CDM methodologies. The definitions of degraded and degrading lands are meant to be applied exclusively in the context of A/R CDM project activities; therefore, they may not necessarily be consistent with other uses of the terms in other contexts.

ESTIMATION OF CARBON STOCKS AND CHANGE IN CARBON STOCKS OF TREES AND SHRUBS IN A/R CDM PROJECT ACTIVITIES

This tool can be used for estimation of carbon stocks and change in carbon stocks of trees and shrubs in the baseline and project scenarios of an A/R CDM project activity. This tool has no specific internal applicability conditions.

ESTIMATION OF THE INCREASE IN GHG EMISSIONS ATTRIBUTABLE TO DISPLACEMENT OF PRE-PROJECT AGRICULTURAL ACTIVITIES IN A/R CDM PROJECT ACTIVITY

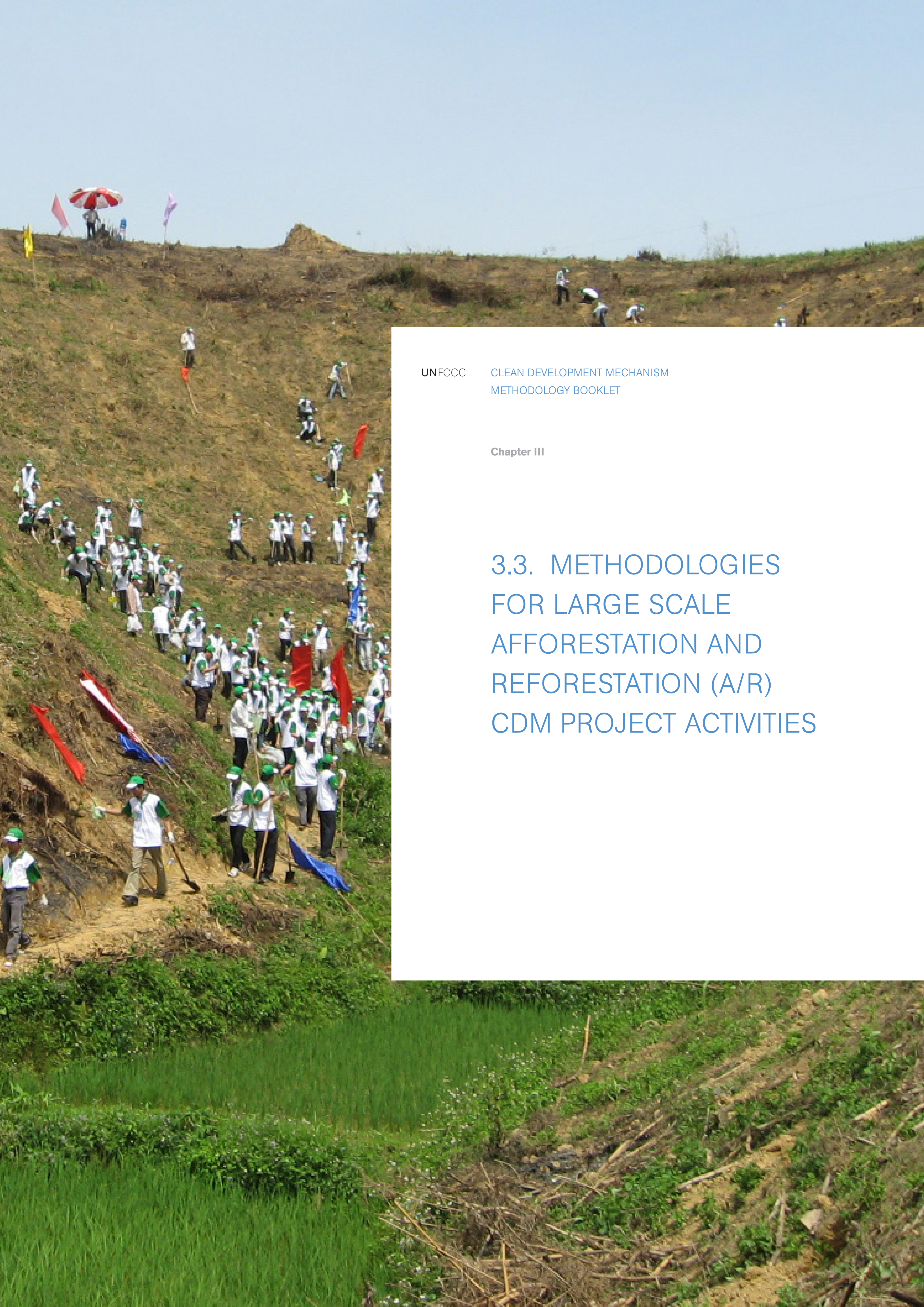
This tool is applicable for estimating the increase of GHG emissions attributable to the displacement of pre-project agricultural activities ("leakage") due to implementation of an A/R CDM project activity, which cannot be considered insignificant (using the respective guidelines). Itl is not applicable if the displacement of agricultural activities attributable to the A/R CDM project is expected to cause any drainage of wetlands or peatlands.

Note: This tool supersedes the A/R methodological tool: "Estimation of GHG emissions related to displacement of grazing activities in A/R CDM project activity" on 4 June 2011.

TOOL FOR ESTIMATION OF CHANGE IN SOIL ORGANIC CARBON STOCKS DUE TO THE IMPLEMENTATION OF A/R CDM PROJECT ACTIVITIES

This tool estimates the change, occurring in a given year, in soil organic carbon (SOC) stocks of land within the boundary of an A/R CDM project.

The tool is only applicable if litter remains on site during the A/R CDM project and soil disturbance for site preparation and project activity is limited. It is not applicable on land containing organic soils or wetlands.



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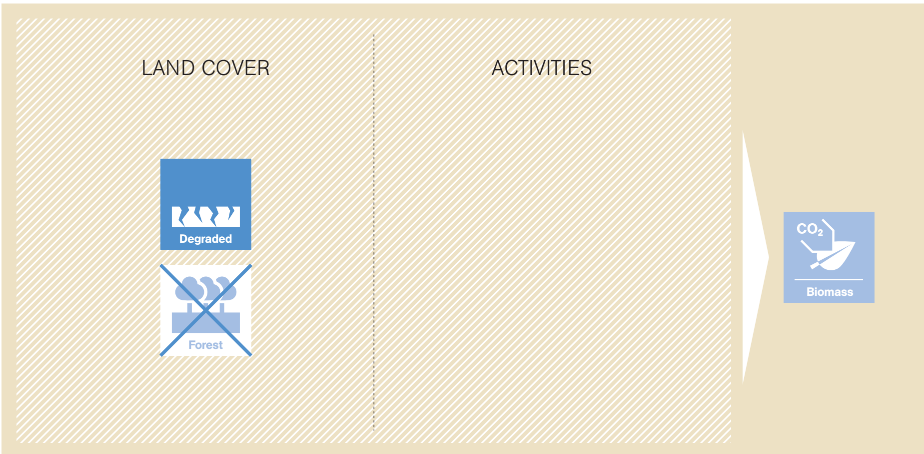
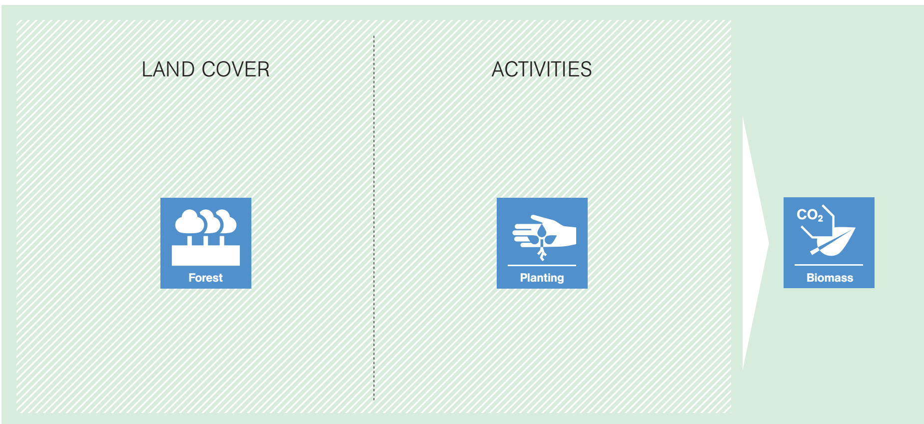
3.3. METHODOLOGIES FOR LARGE SCALE AFFORESTATION AND REFORESTATION (A/R) CDM PROJECT ACTIVITIES

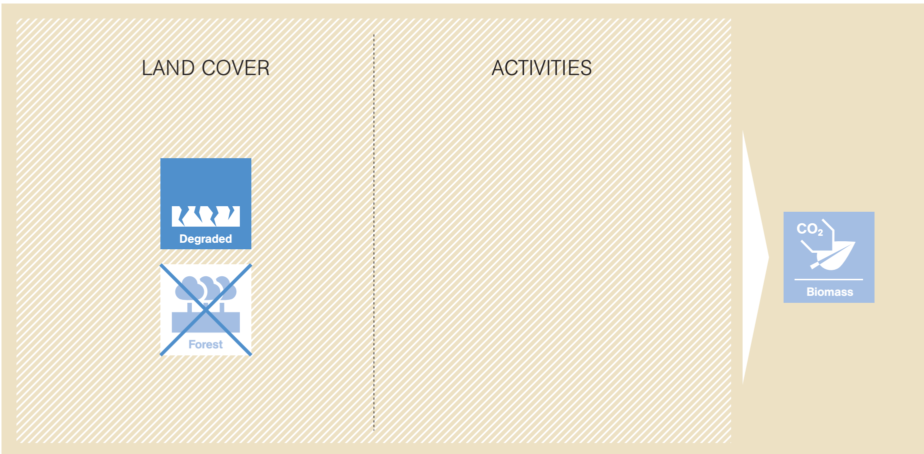
AR-AM0002 Restoration of degraded lands through afforestation/reforestation

Typical project(s)	Afforestation/reforestation of degraded lands.
Type of GHG emissions mitigation action	• GHG removal by sinks. CO_2 removal by increasing carbon stocks in the following pools: above-ground biomass, below-ground biomass, deadwood, litter, and soil organic carbon.
Important conditions under which the methodology is applicable	• The project is implemented on degraded lands that are expected to remain degraded or continue to degrade in the absence of the project; • No leakage: the project does not lead to a shift of pre-project activities outside the project boundary.
Important parameters	At validation: • Ex-ante estimates for carbon stock changes in all pools and for all strata and species or species groups; • Annual increments, allometric equations or biomass expansion factors and root-shoot ratio, density, and carbon fraction for each included carbon pool and tree species or species group.
	Monitored: • Area forested (by species) and area of sample plots; • Diameter, number and possibly height of planted trees and shrubs; • Diameter and number of pieces of dead wood, weight (dry and wet) of litter, soil organic content, density, soil depth; • Area and biomass subject to burning.
BASELINE SCENARIO Lands are degraded.	
PROJECT SCENARIO Forests are planted on lands.	

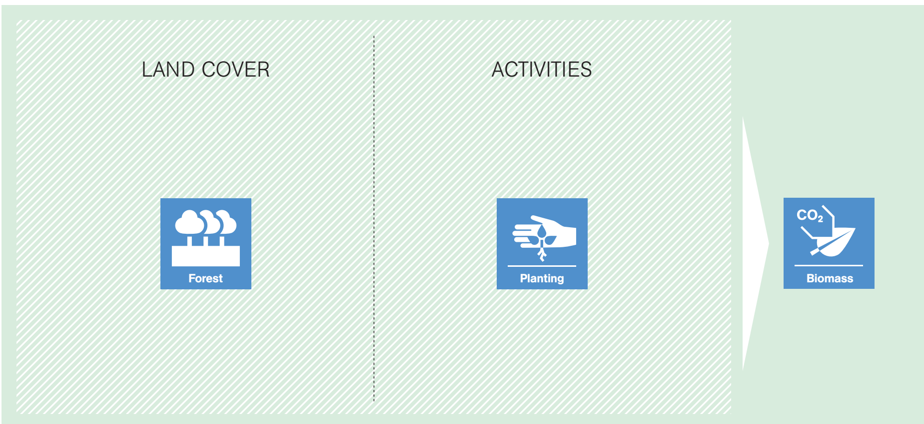
AR-AM0004 Reforestation or afforestation of land currently under agricultural use

Typical project(s)	Afforestation/reforestation of degraded agricultural lands.
Type of GHG emissions mitigation action	• GHG removal by sinks. CO_2 removal by increasing carbon stocks in the following pools: above-ground biomass and below-ground biomass.
Important conditions under which the methodology is applicable	• The project is implemented on degraded lands that are expected to remain degraded or continue to degrade in the absence of the project; • Site preparation does not cause significant longer-term net decreases of soil carbon stocks or increases of non-CO_2 emissions from soil; • The A/R CDM project activity is implemented on land where there are no other on-going or planned afforestation/reforestation activities.
Important parameters	At validation: • Ex-ante estimates for pre-project carbon stocks in biomass; • Annual increments, allometric equations or biomass expansion factors and root-shoot ratio, density, and carbon fraction for tree species/species group.
	Monitored: • Area forested (by species) and area of sample plots; • Diameter, number and possibly height of planted trees; • Number and biomass consumption of grazing animals (including displaced animals) as well as volume of fuelwood collected in project area (both also at validation); • Area and biomass subject to burning.

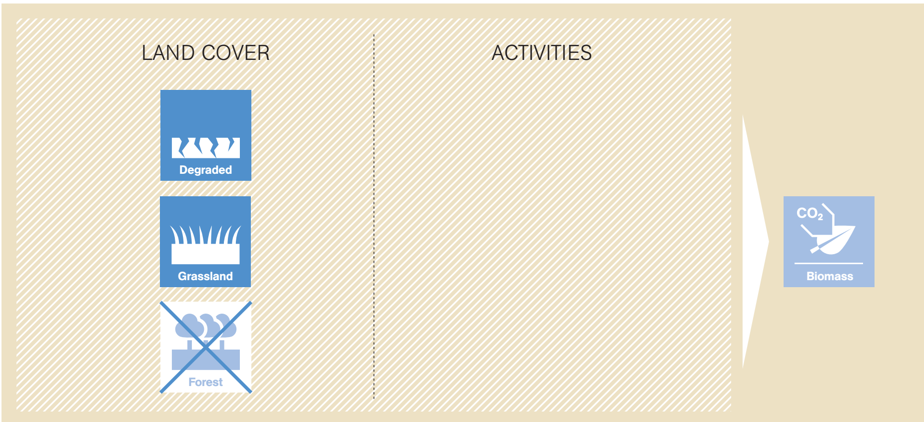
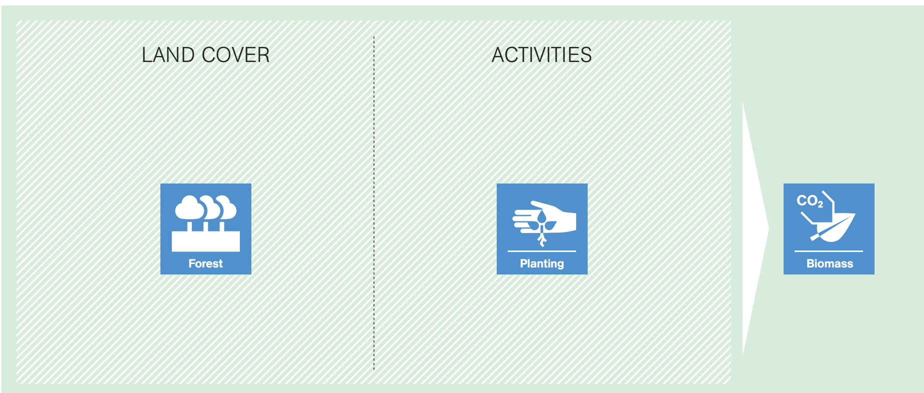
BASELINE SCENARIO
Lands are degraded.



PROJECT SCENARIO
Forests are planted on lands.



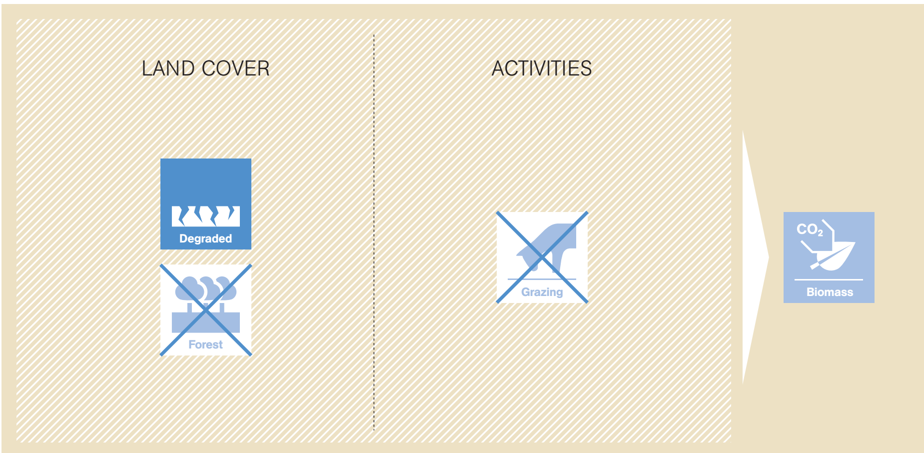
AR-AM0005 Afforestation and reforestation project activities implemented for industrial and/or commercial uses

Typical project(s)	Afforestation/reforestation of degraded grasslands for industrial and/or commercial uses.
Type of GHG emissions mitigation action	• GHG removal by sinks. CO_2 removal by increasing carbon stocks in the following pools: above-ground biomass and below-ground biomass.
Important conditions under which the methodology is applicable	• The project is implemented on degraded grasslands that are expected to remain degraded or to be partly afforested and/or reforested at a rate observed in the periods prior to the A/R CDM project activity; • Soil working does not lead to net reduction in soil organic contents; • Roots of the harvested trees shall not be removed from the soil; • If at least a part of the project activity is implemented on organic soils, drainage of these soils is not allowed and not more than 10% of their area may be disturbed as result of soil preparation for planting.
Important parameters	At validation: • Area of pre-project A/R, stand density (i.e. trees per hectare) and volume; • Annual increments, allometric equations or biomass expansion factors and root-shoot ratio, density, and carbon fraction for each included carbon pool and tree species or species group.
	Monitored: • Area forested (by species) and area of sample plots; • Diameter, number and possibly height of planted trees; • Areas and biomass subject to burning; • Area, number and type of grazing animals displaced (also at validation).
BASELINE SCENARIO Lands are degraded grasslands.	
PROJECT SCENARIO Forests are planted on lands.	

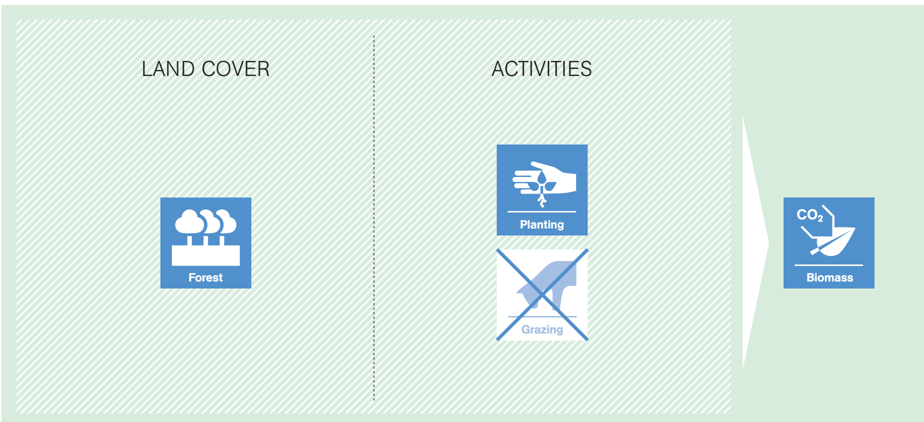
AR-AM0006 Afforestation/reforestation with trees supported by shrubs on degraded land

Typical project(s)	Afforestation/reforestation of degraded lands potentially with inter-cropping between trees.
Type of GHG emissions mitigation action	• GHG removal by sinks. CO_2 removal by increasing carbon stocks in the following pools: above-ground biomass, below-ground biomass, and soil organic carbon.
Important conditions under which the methodology is applicable	• The project is implemented on degraded lands that are expected to remain degraded or continue to degrade in the absence of the project; • Grazing will not occur within the project boundary in both the project case and baseline scenario; • Biomass burning for site preparation is not practiced; • No leakage: the project does not lead to a shift of pre-project activities outside the project boundary except for forage fed livestock.
Important parameters	At validation: • Ex-ante estimates for pre-project carbon stocks in biomass and soil organic carbon; • Annual increments, allometric equations or biomass expansion factors and root-shoot ratio, density, and carbon fraction for tree species/species group and planted non-tree woody vegetation (shrubs).
	Monitored: • Area forested (by species) and area of sample plots; • Diameter, number and possibly height of planted trees and shrubs; • Soil layer dimensions and organic carbon content; • Output of forage (per ha) from project area.

BASELINE SCENARIO
Lands are degraded and there is no animal grazing on lands.



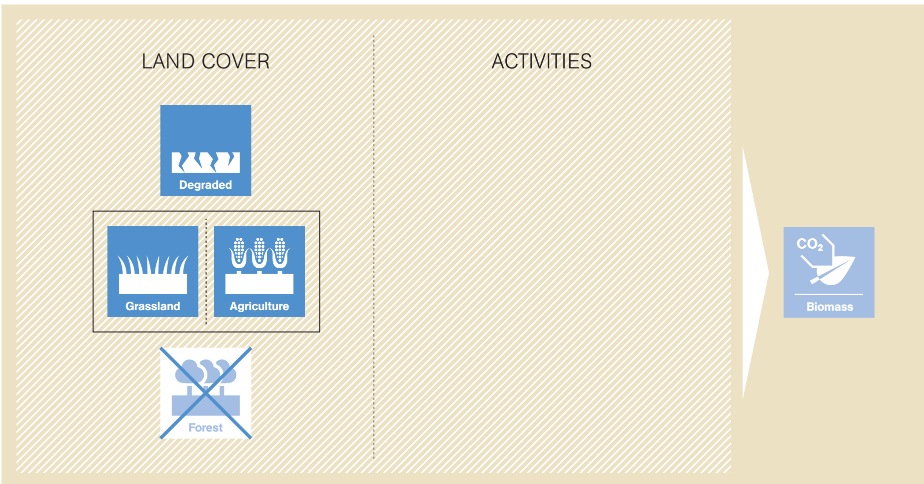
PROJECT SCENARIO
Forests are planted on lands. Animal grazing is not allowed.



AR-AM0007 Afforestation and reforestation of land currently under agricultural or pastoral use

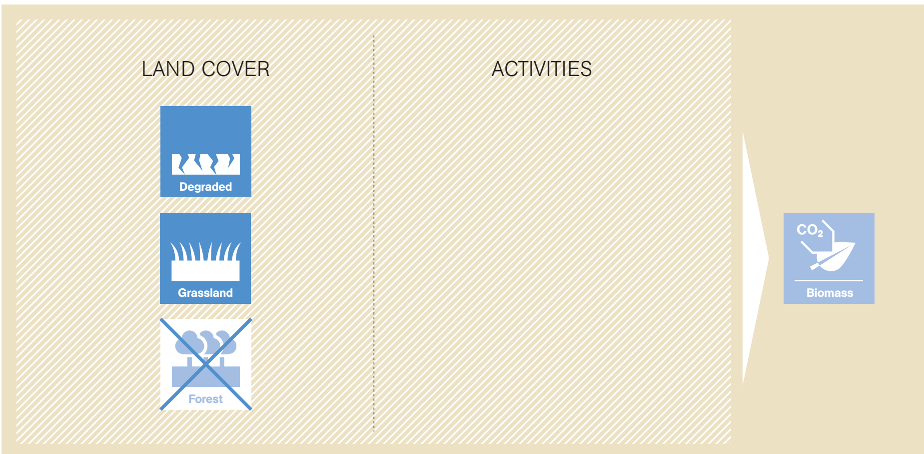
Typical project(s)	Afforestation/reforestation of agricultural and pastoral lands.
Type of GHG emissions mitigation action	• GHG removal by sinks. CO_2 removal by increasing carbon stocks in the following pools: above-ground biomass, below-ground biomass, and optionally deadwood, litter and soil organic carbon.
Important conditions under which the methodology is applicable	• The project is implemented on degraded lands following a period of decreasing intensity of agricultural and pastoral activities and the trend of decrease is expected to continue in absence of the project; • Soil working does not lead to net reduction in soil organic contents; • The pre-project crown cover of trees within the project boundary is less than 20% of the threshold for crown cover reported to the EB by the host Party; • No leakage: the project does not lead to a shift of pre-project activities outside the project boundary; agricultural and pastoral activities are stopped at project start.
Important parameters	At validation: • Pre-project tree stand density (i.e. trees per hectare) and volume; • Annual increments, allometric equations or biomass expansion factors and root-shoot ratio, density, and carbon fraction for each included carbon pool and tree species or species group and optionally for planted non-tree woody vegetation (shrubs);
	Monitored: • Area forested (by species) and area of sample plots; • Diameter, number and possibly height of planted trees and optionally shrubs; • If pools are included: diameter and number of pieces of dead wood, weight (dry and wet) of litter, soil layer dimensions and organic carbon content; • Area and biomass subject to burning.

BASELINE SCENARIO
Lands are degraded agricultural or grasslands with decreasing intensity of agricultural or grazing activities.



PROJECT SCENARIO
Forests are planted on lands. Animal grazing is not allowed.

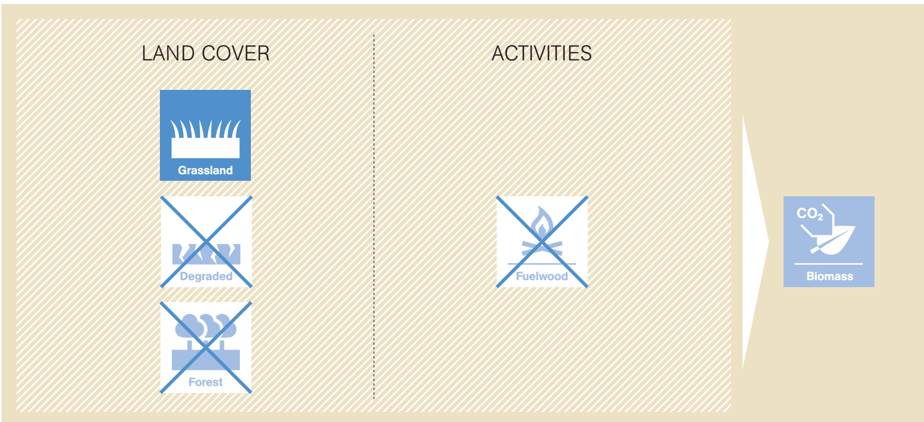
AR-AM0009 Afforestation or reforestation on degraded land allowing for silvopastoral activities

Typical project(s)	Afforestation/reforestation of degraded grasslands potentially with silvopastoral activities.
Type of GHG emissions mitigation action	• GHG removal by sinks. CO_2 removal by increasing carbon stocks in the following pools: above-ground biomass, below-ground biomass, and optionally deadwood, litter and soil organic carbon.
Important conditions under which the methodology is applicable	• The project is implemented on degraded grasslands that are expected to remain degraded without human intervention; • Site preparation and project management practices do not involve biomass burning; • Manure from pasture and range grazing animals shall not be collected, stored or burned; • Ploughing/ripping/scarification associated with site preparation for planting, seeding and/or the human-induced promotion of natural seed sources, shall not exceed 10% of the project area (during each occasion); • No leakage: the project does not lead to a shift of pre-project activities outside the project boundary.
Important parameters	At validation: • Pre-project tree stand density (i.e. trees per hectare) and volume; • Annual increments, allometric equations or biomass expansion factors and root-shoot ratio, density, and carbon fraction for each included carbon pool for tree species/species group and optionally for planted non-tree woody vegetation (shrubs).
	Monitored: • Area forested (by species) and area of sample plots; • Diameter, number and possibly height, of planted trees and optionally shrubs; • If pools are included: diameter and number of pieces of dead wood, weight (dry and wet) of litter.
BASELINE SCENARIO Lands are degraded grasslands.	
PROJECT SCENARIO Forests are planted on lands.	

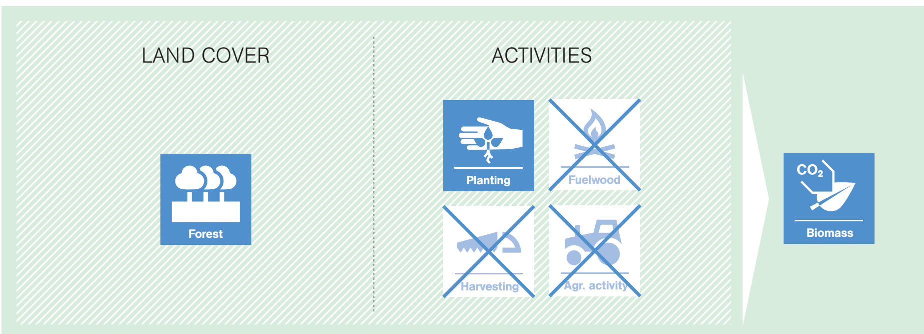
AR-AM0010 Afforestation and reforestation project activities implemented on unmanaged grassland in reserve/protected areas

Typical project(s)	Afforestation/reforestation of on unmanaged grassland in reserves or protected areas.
Type of GHG emissions mitigation action	• GHG removal by sinks. CO_2 removal by increasing carbon stocks in the following pools: above-ground biomass and below-ground biomass.
Important conditions under which the methodology is applicable	• Land to be afforested or reforested shall comprise unmanaged, not severely degraded grassland which is designated as a reserve/protected area, and is not likely to be converted to any other land use except forestry; • Soil working does not lead to net reduction in soil organic contents; • No direct human-induced activities leading to loss of carbon stocks (such as harvesting, selective logging, fuel gathering, removal of litter, or removal of dead wood) shall occur on lands within the project boundary; • No leakage: the project activity does not lead to a shift of pre-project activities outside the project boundary.
Important parameters	At validation: • Stratification, quantification and expected development of vegetation cover (grass, shrubs, trees) on project area (historic, current and expected in absence of the project); • Annual increment, allometric equations or biomass expansion factors and root-shoot ratio, density, carbon fraction, and combustion efficiency for each tree species or species group, non-tree woody vegetation (shrubs) and herbaceous vegetation.
	Monitored: • Area forested (by species) and area of sample plots; • Diameter, number and possibly height, of planted trees and shrubs; inventory of herbaceous vegetation; • Biomass loss due to decrease in pre-project vegetation (removal or death due to competition) or burning (human-induced or wildfires).

BASELINE SCENARIO
Lands are unmanaged, not severely degraded grasslands in reserves or protected areas. Fuelwood collection is not allowed.



PROJECT SCENARIO
Forests are planted on lands. Fuelwood collection or any other human activities such as harvesting or agricultural activities are not allowed.



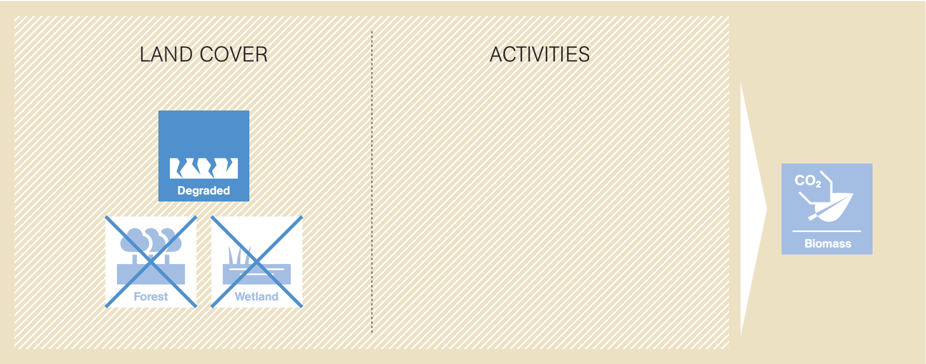
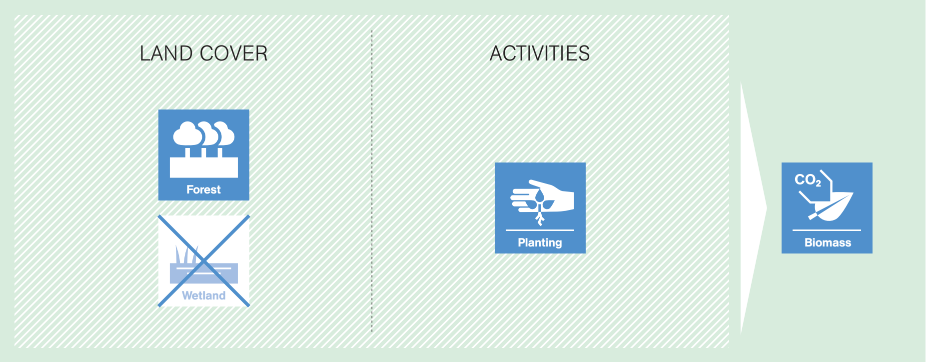
AR-AM0011 Afforestation and reforestation of land subject to polyculture farming

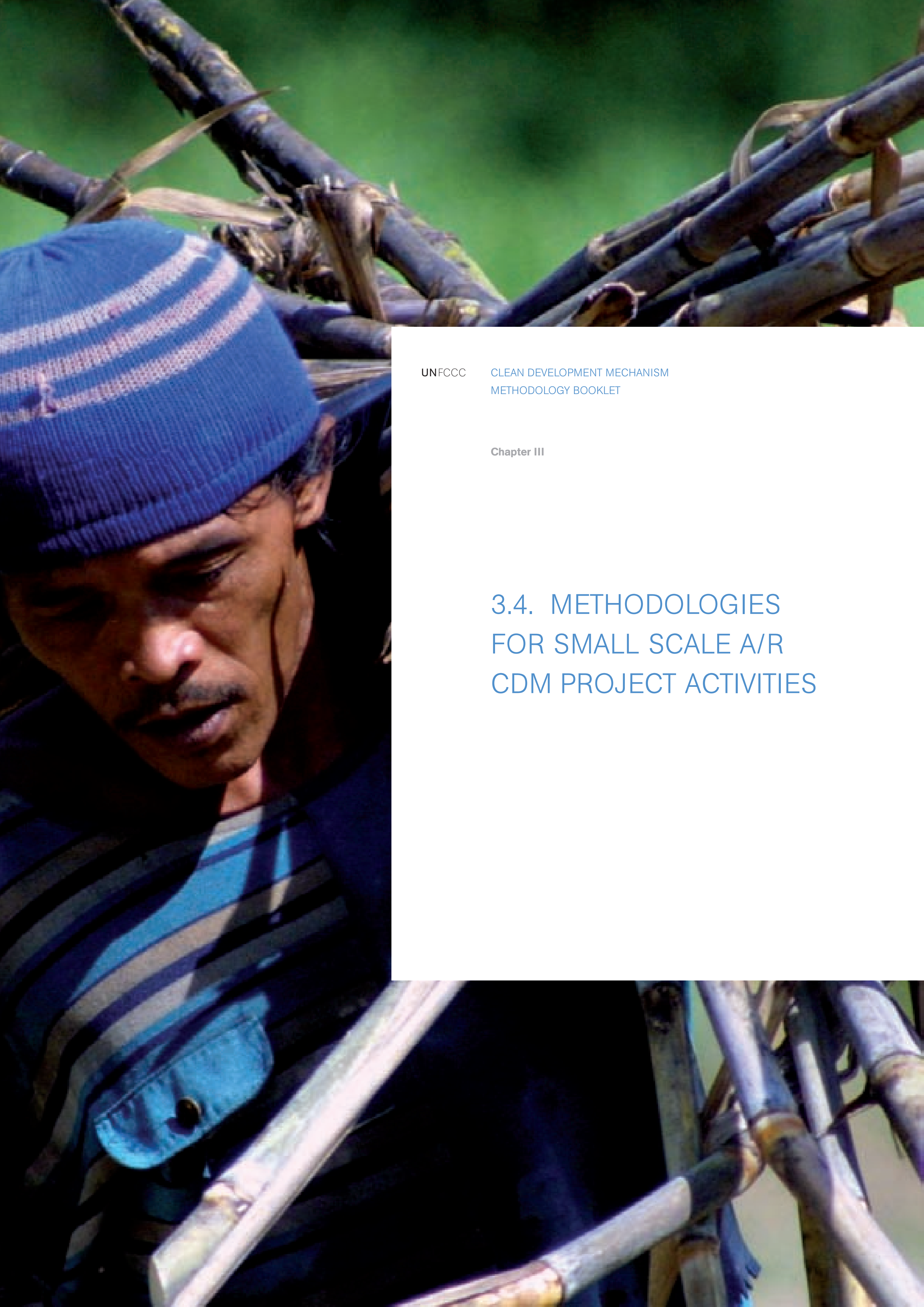
Typical project(s)	Afforestation/reforestation of land containing polyculture, possibly including perennial tree crops and/or fallow periods with woody regrowth.
Type of GHG emissions mitigation action	• GHG removal by sinks. CO_2 removal by increasing carbon stocks in the following pools: above-ground biomass and below-ground biomass.
Important conditions under which the methodology is applicable	• The project is implemented on land subjected to polycultures in which the fallow part of the cycle is completed and all the existing vegetation present on the parcels is expected to be cleared for the next production cycle; • The project is not implemented on grasslands or organic soils.
Important parameters	At validation: • Annual increment, allometric equations or biomass expansion factors and root-shoot ratio, density, and carbon fraction for tree species/species group.
	Monitored: • Area forested (by species) and area of sample plots; • Diameter, number and possibly height of planted trees; • Area and biomass subject to burning; • Area used for agricultural activities displaced by project activity (also at validation).

BASELINE SCENARIO
Land is polyculture agricultural land. Grassland is not allowed.

PROJECT SCENARIO
Forests are planted on part of the polyculture lands; others are covered by polyculture crops.

AR-ACM0001 Afforestation and reforestation of degraded land

Typical project(s)	Afforestation/reforestation of degraded lands.
Type of GHG emissions mitigation action	• GHG removal by sinks. CO_2 removal by increasing carbon stocks in the following pools: above-ground biomass, below-ground biomass, and optionally deadwood, litter, and soil organic carbon.
Important conditions under which the methodology is applicable	• The project is implemented on degraded lands that are expected to remain degraded or to continue to degrade in the absence of the project; • If at least a part of the project activity is implemented on organic soils, drainage of these soils is not allowed and not more than 10% of their area may be disturbed as result of soil preparation for planting; • The land does not fall into wetland category; • Litter shall remain on site and not be removed in the A/R CDM project activity; • Ploughing/ripping/scarification attributable to the A/R CDM project activity, if any, is (i) Done in accordance with appropriate soil conservation practices, e.g. follows the land contours; (ii) Limited to the first five years from the year of initial site preparation; (iii) Not repeated, if at all, within a period of 20 years.
Important parameters	At validation: • Annual increments, allometric equations or biomass expansion factors and root-shoot ratio, density, and carbon fraction for tree species/species group;
	Monitored: • Area forested (by species) and area of sample plots; • Diameter, number and possibly height of planted trees; • If pools are included: diameter and number of pieces of dead wood, weight of litter; • Area and biomass subject to burning; • Area, number and type of grazing animals displaced (also at validation).
BASELINE SCENARIO Lands are degraded.	
PROJECT SCENARIO Forests are planted on lands.	



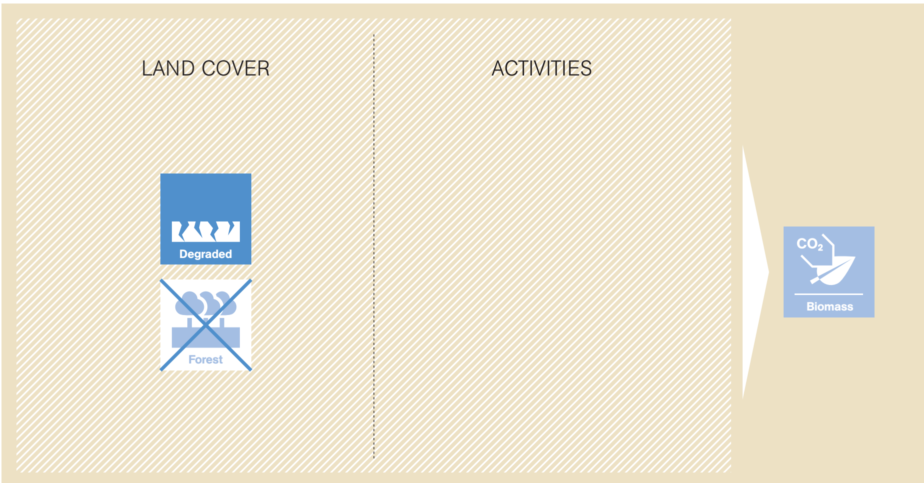
Chapter III

3.4. METHODOLOGIES FOR SMALL SCALE A/R CDM PROJECT ACTIVITIES

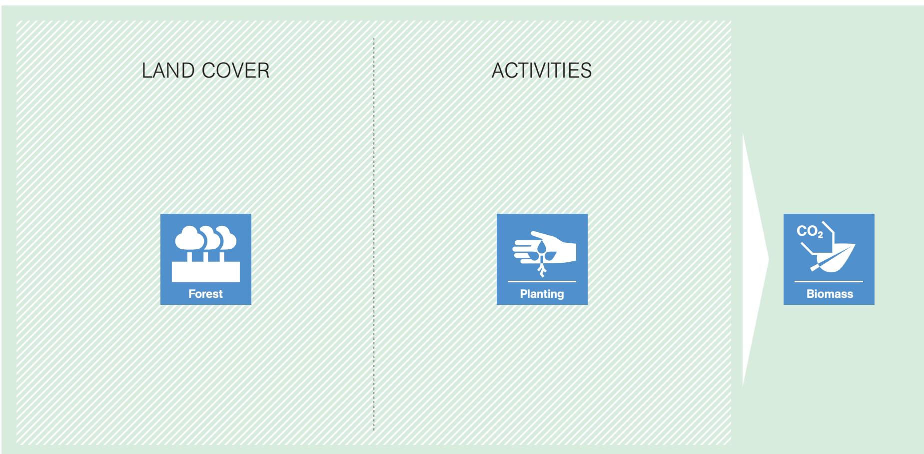
AR-ACM0002 Afforestation or reforestation of degraded land without displacement of pre-project activities

Typical project(s)	Afforestation/reforestation of degraded lands without displacement of pre-project activities.
Type of GHG emissions mitigation action	• GHG removal by sinks. CO_2 removal by increasing carbon stocks in the following pools: above-ground biomass, below-ground biomass, and optionally soil organic carbon.
Important conditions under which the methodology is applicable	• The project is implemented on degraded lands that are expected to remain degraded or continue to degrade in the absence of the project; • Soil working does not lead to net reduction in soil organic contents; • No leakage: the project does not lead to a shift of pre-project activities outside the project boundary.
Important parameters	At validation: • Annual increments, allometric equations or biomass expansion factors and root-shoot ratio, density, and carbon fraction for tree species/species group; • Pre-project tree stand density (i.e. trees per hectare) and volume.
	Monitored: • Area forested (by species) and area of sample plots; • Diameter, number and possibly height of planted trees; • Area and biomass subject to burning.

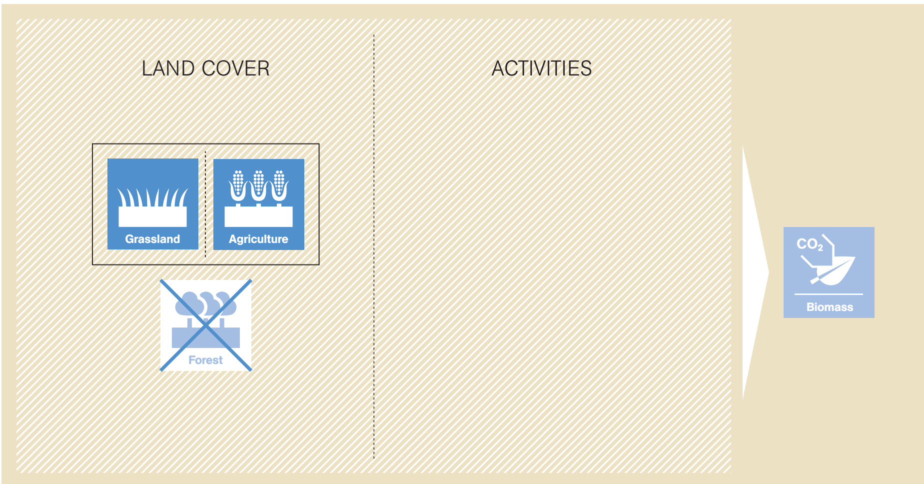
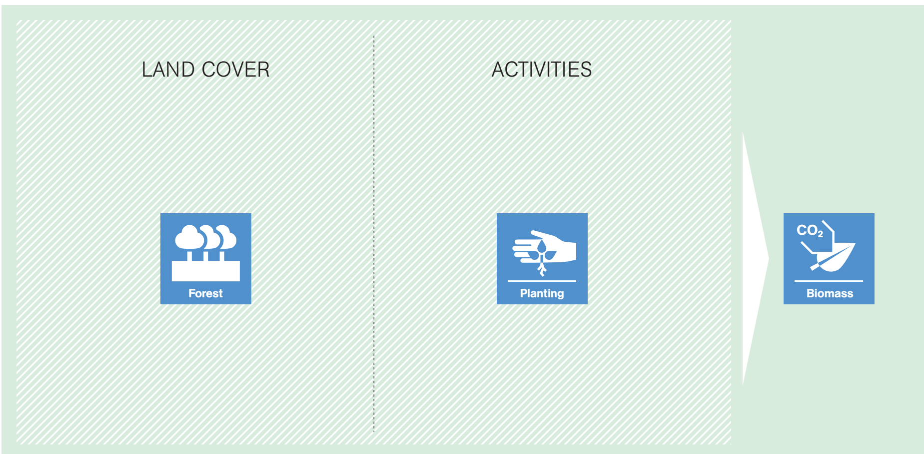
BASELINE SCENARIO
Lands are degraded.



PROJECT SCENARIO
Forests are planted on lands.



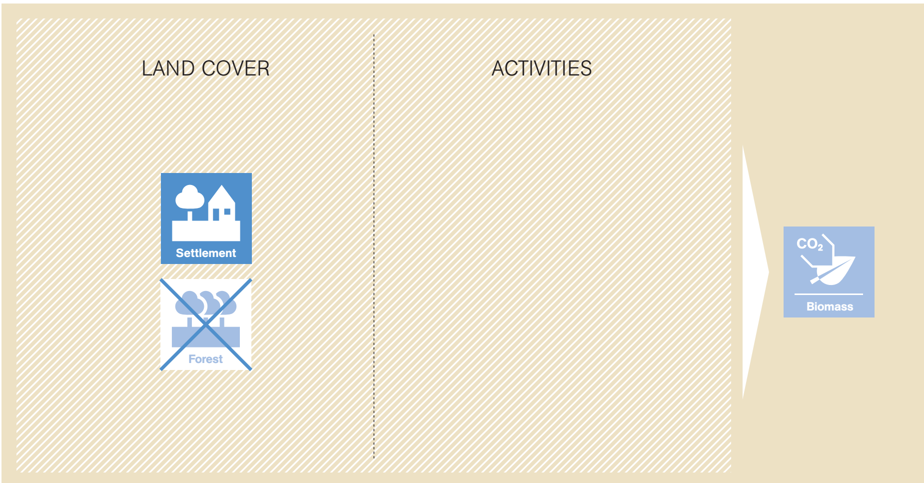
AR-AMS0001 Simplified baseline and monitoring methodologies for small-scale A/R CDM project activities implemented on grasslands or croplands with limited displacement of pre-project activities

Typical project(s)	Afforestation/reforestation of grasslands or croplands.
Type of GHG emissions mitigation action	• GHG removal by sinks. CO_2 removal by increasing carbon stocks in the following pools: above-ground and below ground tree and woody perennials biomass, and below-ground biomass of grasslands.
Important conditions under which the methodology is applicable	• The project is implemented on grasslands or croplands; • The area of the cropland within the project boundary displaced due to the project activity is less than 50 per cent of the total project area; • The number of displaced grazing animals is less than 50 per cent of the average grazing capacity1 of the project area; • Project activities are implemented on lands where ≤ 10% of the total surface project area is disturbed as result of soil preparation for planting.
Important parameters	At validation: • Annual increment, allometric equations or biomass expansion factors and root-shoot ratio, density, and carbon fraction for tree species/species group.
	Monitored: • Area forested (by species) and area of sample plots; • Diameter, number, and possibly height of planted trees; • Area used for agricultural activities and number of domesticated grazing animals displaced by project activity (both also at validation).
BASELINE SCENARIO Lands are grasslands or agricultural land.	
PROJECT SCENARIO Forests are planted on lands.	

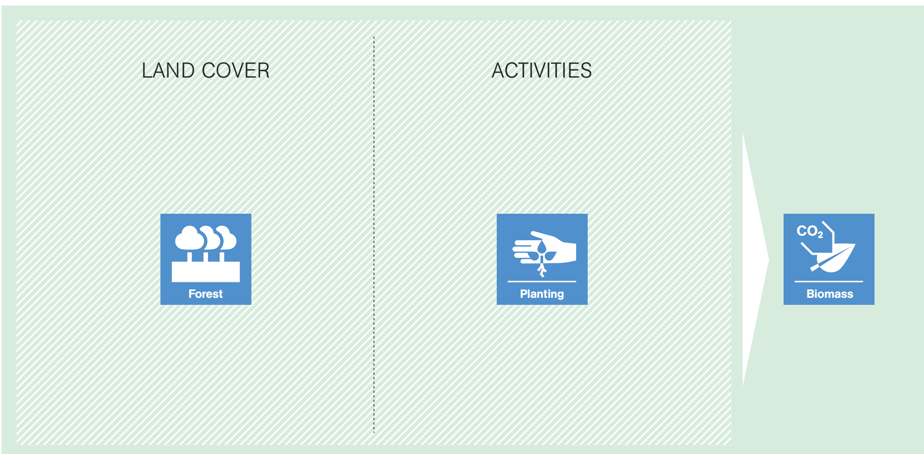
AR-AMS0002 Simplified baseline and monitoring methodologies for small-scale afforestation and reforestation project activities under the CDM implemented on settlements

Typical project(s)	Afforestation/reforestation of settlement lands.
Type of GHG emissions mitigation action	• GHG removal by sinks. CO_2 removal by increasing carbon stocks in the following pools: above-ground biomass and below-ground biomass.
Important conditions under which the methodology is applicable	• The project is implemented on settlement lands, e.g. lands along roads, power lines, pipelines, waterways, or lands under urban or rural amenities such as gardens, fields, parks, etc; • The areas used for agricultural activities within the project boundary, and displaced due to the project activity, are less than 50 per cent of the total project area; • Project activities are implemented on lands where ≤ 10% of the total surface project area is disturbed as result of soil preparation for planting.
Important parameters	At validation: • Annual increment, allometric equations or biomass expansion factors and root-shoot ratio, density, and carbon fraction for tree species/species group.
	Monitored: • Area forested (by species) and area of sample plots; • Diameter, number and possibly height of planted trees; • Area used for agricultural activities displaced by project activity (also at validation).

BASELINE SCENARIO
Lands are settlement lands.



PROJECT SCENARIO
Forests are planted on lands.



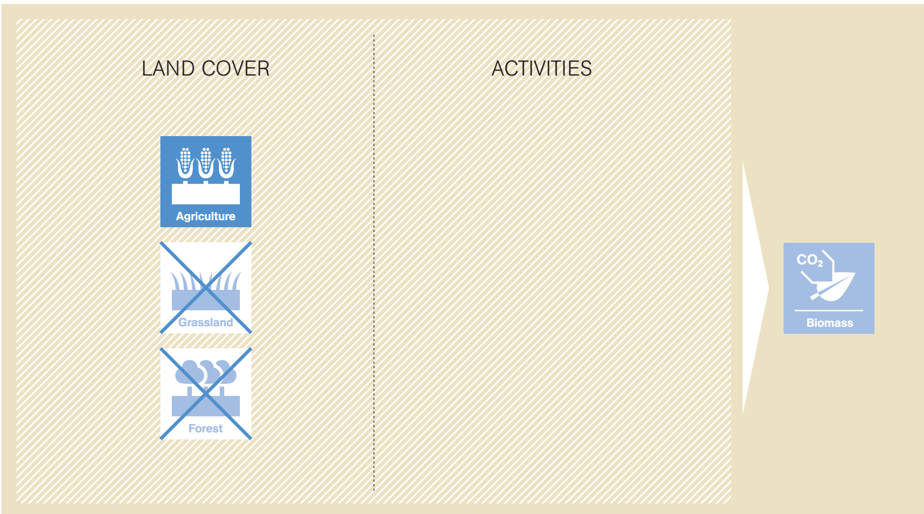
AR-AMS0003 Simplified baseline and monitoring methodology for small scale CDM afforestation and reforestation project activities implemented on wetlands

Typical project(s)	Afforestation/reforestation of wetlands.
Type of GHG emissions mitigation action	• GHG removal by sinks. CO_2 removal by increasing carbon stocks in the following pools: above-ground biomass and below-ground biomass.
Important conditions under which the methodology is applicable	• The project is implemented on degraded wetlands, which may be subject to further degradation and have tree and/or non tree component that is declining or in a low carbon steady-state; • The project is restricted to degraded intertidal wetlands, undrained degraded peat swamps, degraded flood plain areas on inorganic soils, and seasonally flooded areas on the margin of water bodies/reservoirs; • The project area does not include wetlands where the predominant vegetation comprises of herbaceous species in its natural state; • Direct measures shall not lead to changes in hydrology of land (e.g. no drainage, flooding, digging or ditch blocking); • Project activities are implemented on lands where in the pre-project situation, areas used for agricultural activities (other than grazing) within the project boundary are not greater than 10% of the total project area; • Project activities are implemented on lands where displacement of grazing animals does not result in leakage; • Project activities are implemented on lands where $<10\%$ of the total surface project area is disturbed as result of soil preparation for planting. However, in project areas with organic soils, site preparation activities such as ploughing and drainage before or after the trees are planted are not allowed.
Important parameters	At validation: • Annual increment, allometric equations or biomass expansion factors and root-shoot ratio, density, and carbon fraction for tree species/species group.
	Monitored: • Area forested (by species) and area of sample plots; • Diameter, number and possibly height of planted trees; • Area used for agricultural activities as well as fuelwood volume displaced by project activity (both also at validation).
BASELINE SCENARIO Lands are degraded wetlands.	
PROJECT SCENARIO Forests are planted on the wetlands.	

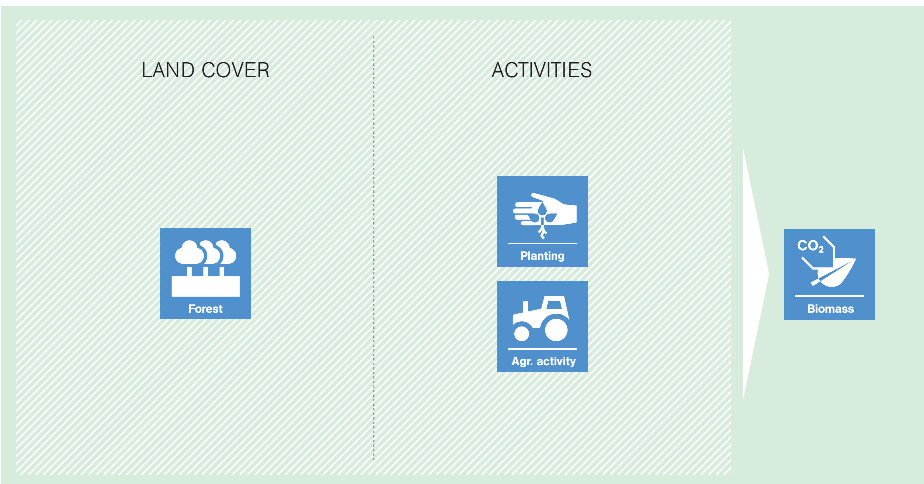
AR-AMS0004 Simplified baseline and monitoring methodology for small-scale agroforestry – afforestation and reforestation project activities under the clean development mechanism

Typical project(s)	Afforestation/reforestation of lands for agroforestry activities.
Type of GHG emissions mitigation action	• GHG removal by sinks. CO_2 removal by increasing carbon stocks in the following pools: above-ground biomass, below-ground biomass, and soil organic carbon.
Important conditions under which the methodology is applicable	• The project is not implemented on grasslands; • The project leads to establishment of forest and allows for continuation or introduction of a cropping regime; • Implementation of the project does not lead to more than 20% decrease in the pre-project area of cultivated crops; • No leakage: the project activity does not lead to a shift of pre-project activities outside the project boundary.
Important parameters	At validation: • Allometric equations or biomass expansion factors and root-shoot ratio, density, and carbon fraction for tree species/species group.
	Monitored: • Area forested (by species) and area of sample plots; • Diameter, number and possibly height of planted trees.

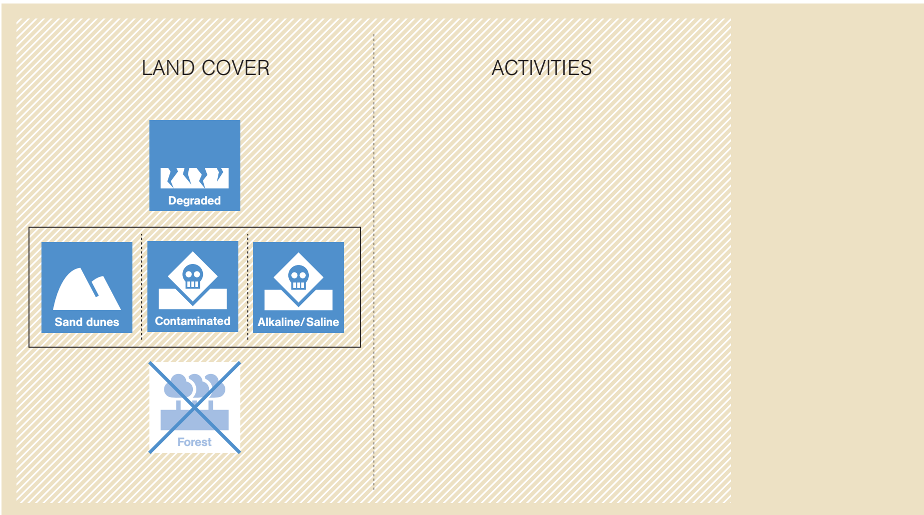
BASELINE SCENARIO
Lands are agricultural land.
Grasslands are not allowed.



PROJECT SCENARIO
Forests are planted on lands, with agricultural intercropping.

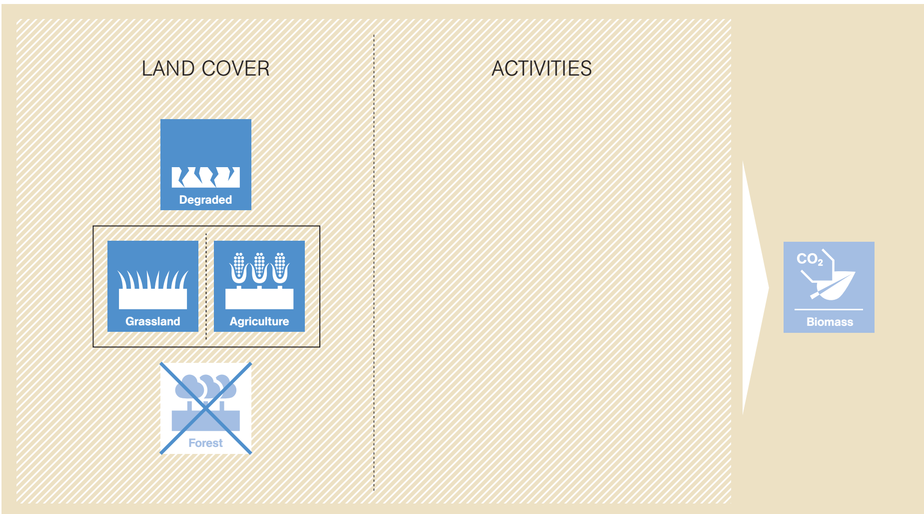


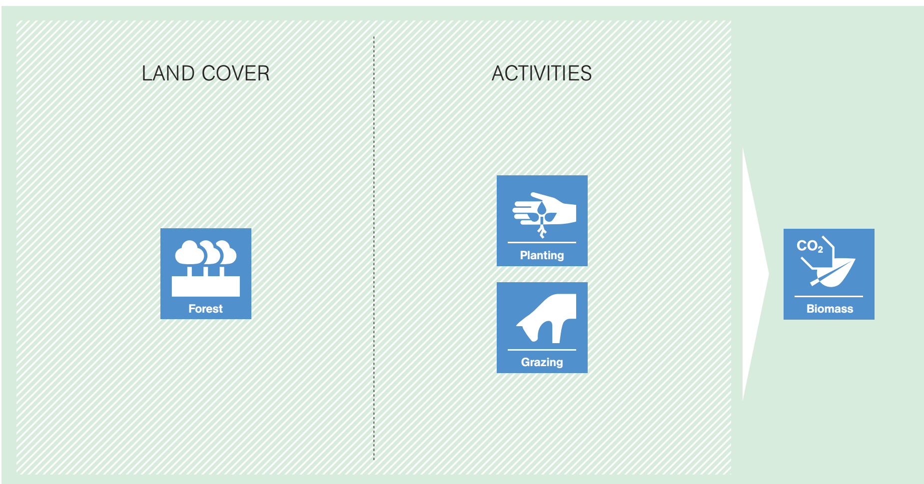
AR-AMS0005 Simplified baseline and monitoring methodology for small-scale afforestation and reforestation project activities under the clean development mechanism implemented on lands having low inherent potential to support living biomass

Typical project(s)	Afforestation/reforestation of lands having low inherent potential to support living biomass.
Type of GHG emissions mitigation action	• GHG removal by sinks. CO_2 removal by increasing carbon stocks in the following pools: above-ground biomass, below-ground biomass, and soil organic carbon.
Important conditions under which the methodology is applicable	• Project activities are implemented on areas having low inherent potential to support living biomass without human intervention, i.e. sand dunes, bare lands, contaminated or mine spoils lands, or highly alkaline or saline soils; • No leakage: the project activity does not lead to a shift of pre-project activities outside the project boundary.
Important parameters	At validation: • Allometric equations or biomass expansion factors and root-shoot ratio, density, and carbon fraction for tree species/species group.
	Monitored: • Area forested (by species) and area of sample plots; • Diameter, number and possibly height of planted trees.
BASELINE SCENARIO Lands are degraded; bare, sand dunes, contaminated or mine spoils lands, or highly alkaline or saline soils with low biomass content.	
PROJECT SCENARIO Forests are planted on lands.	

AR-AMS0006 Simplified baseline and monitoring methodology for small-scale silvopastoral – afforestation and reforestation project activities under the clean development mechanism

Typical project(s)	Afforestation/reforestation of degraded land for silvopastoral activities.
Type of GHG emissions mitigation action	GHG removal by sinks. CO_2 removal by increasing carbon stocks in the following pools: above-ground biomass, below-ground biomass, and soil organic carbon.
Important conditions under which the methodology is applicable	• The project is implemented on degraded croplands or grasslands subjected to grazing activities; • The project leads to establishment of forest in a silvopastoral system; • The pre-project crown cover of trees within the project boundary is less than 20% of the threshold for crown cover reported to the EB by the host Party; • No leakage: the project activity does not lead to a shift of pre-project activities outside the project boundary.
Important parameters	At validation: • Allometric equations or biomass expansion factors and root-shoot ratio, density, and carbon fraction for tree species/species group.
	Monitored: • Area forested (by species) and area of sample plots; • Diameter, number and possibly height of planted trees.
BASELINE SCENARIO Lands are degraded agricultural lands or grasslands.	(see diagram below)
PROJECT SCENARIO Forests are planted on lands. Project activities include animal grazing.	

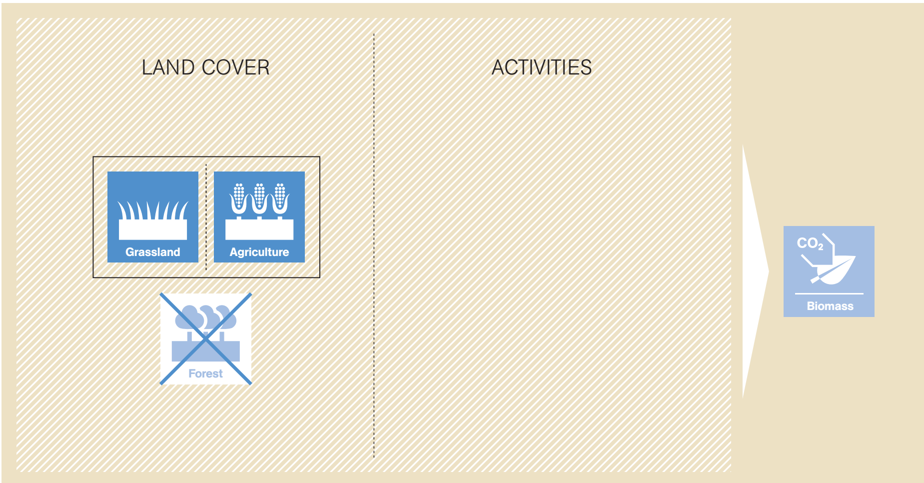




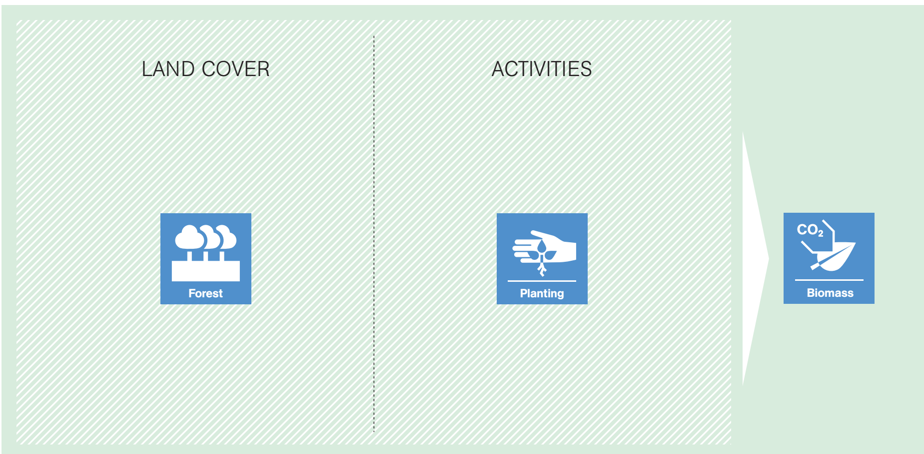
AR-AMS0007 Simplified baseline and monitoring methodology for small-scale A/R CDM project activities implemented on grasslands or croplands

Typical project(s)	Afforestation/reforestation of degraded croplands or grasslands.
Type of GHG emissions mitigation action	GHG removal by sinks. CO_2 removal by increasing carbon stocks in the following pools: above-ground biomass, below-ground biomass, and soil organic carbon.
Important conditions under which the methodology is applicable	• The project is implemented on grasslands or croplands;. • The land does not contain organic soils (e.g. peat-land) and does not fall into wetland category; • Litter remains on site and is not removed in the project; • Ploughing/ripping/scarification in the project, if any, is: (i) Done in accordance with appropriate soil conservation practices, e.g. follows the land contours; (ii) Limited to the first five years from the year of initial site preparation; (iii) Not repeated, if at all, within a period of 20 years.
Important parameters	At validation: • Annual increment, allometric equations or biomass expansion factors and root-shoot ratio, density, and carbon fraction for tree species/species group.
	Monitored: • Area forested (by species) and area of sample plots; • Diameter, number, and possibly height of planted trees.

BASELINE SCENARIO
Lands are grasslands or agricultural land.



PROJECT SCENARIO
Forests are planted on lands.



Chapter IV

GLOSSARY

GENERAL GLOSSARY

Explanations on general terminologies used in this booklet are listed below. For terminologies specific to a certain methodology, please refer to the definition section of the full methodology. A specific glossary for A/R methodolgies follows this list.

Additionality	A CDM project is additional if anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the proposed project.
Afforestation	"Afforestation" is the direct human-induced conversion of land that has not been forested for a period of at least 50 years to forested land through planting, seeding and/or the human-induced promotion of natural seed sources.
Capacity addition	A capacity addition is an increase in the installed power generation capacity of an existing power plant through the installation of a new power plant beside the existing power plant/units, or the installation of new power units, additional to the existing power plant/units. The existing power plant/units continue to operate after the implementation of the project activity.
Capacity increase	A (minor) increase in the design capacity due to the installation of improved equipment compared to the original design.
Captive generation	Captive generation is defined as generation of electricity in a power plant that supplies electricity only to consumer(s) or multiple consumers and not to the electricity grid. The consumer(s) or multiple consumers are either located directly at the site of the power plant or are connected through dedicated electricity line(s) with the power plant but not via the electricity grid.
Baseline (scenario)	A baseline scenario for a CDM project is the scenario that reasonably represents GHG emissions that would occur in the absence of the proposed project.
Biomass	Biomass means non-fossilized and biodegradable organic material originating from plants, animals and micro-organisms. This shall also include products, by-products, residues and waste from agriculture, forestry and related industries as well as the non-fossilized and biodegradable organic fractions of industrial and municipal wastes. Biomass also includes gases and liquids recovered from the decomposition of non-fossilized and biodegradable organic material.
Biomass, non-renewable	Biomass, not fulfilling the conditions of renewable biomass, is considered as non-renewable.
Biomass, renewable	Biomass is "renewable" if one of five conditions applies. These are described in the CDM glossary (see renewable biomass <https://cdm.unfccc.int/Reference/glossary.html>)
Biomass, residues	Biomass that is a by-product, residue or waste stream from agriculture, forestry and related industries.
Carbon sequestration	Carbon sequestration is defined as a biological, chemical or physical process of removing carbon from the atmosphere and depositing it in a reservoir.
Cogeneration	A cogeneration plant is a heat and power generation plant in which at least one heat engine simultaneously generates both heat and power. If power, heat and cooling is provided at the same time, the term tri-generation is used instead of co-generation.
Degraded land	Land degradation is a long-term decline in ecosystem function and productivity and measured in terms of net primary productivity. All forms of land degradation will ultimately lead to a reduction of soil fertility and productivity. The general effect is reduced plant growth, which in turn causes loss of protective soil cover and increased vulnerability of soil and vegetation to further degradation (e.g. erosion).
Emission factor	An emission factor is defined as the measure of the average amount of GHG emitted to the atmosphere by a specific process, fuel, equipment, or source.

Energy efficiency	Energy efficiency is defined as the improvement in the service provided per unit power, that is, project activities which increase unit output of traction, work, electricity, heat, light (or fuel) per MW input are energy efficiency project activities.
Feedstock	Raw material used in manufacture. Can be gaseous, liquid or solid.
Fossil fuel	Fuels formed by natural resources such as anaerobic decomposition of buried dead organisms (e.g. coal, oil, and natural gas).
Greenfield	Greenfield activities refer to the construction of a new facility at a location where previously no facility exists. E.g. construction of new power plant where previously no power generation activity exists.
Greenhouse gas	Gases in an atmosphere that absorb and emit radiation within the thermal infrared range, which is the fundamental cause of the greenhouse effect.
Grid	The grid or electricity system is an interconnected network for delivering electricity from suppliers to consumers. It includes all power plants that are physically connected through transmission and distribution lines.
Industrial gases	Greenhouse gases originating from chemical production processes that are not naturally occurring. In addition, N_2O from chemical production processes is included in this group of greenhouse gases.
Land use, land-use change and forestry	A GHG inventory sector that covers emissions and removals of GHG resulting from direct human-induced land use, land-use change and forestry activities.
Leakage	The net change of anthropogenic emissions by sources of GHG that occurs outside the project boundary, and which is measurable and attributable to the project.
Low-carbon electricity	Electricity that is generated with a less-GHG-intensive fuel than in the baseline (e.g., natural gas in the project, and coal in the baseline).
Merit order	A way of ranking available power plants in ascending order of their short-run marginal costs of production, so that those with the lowest marginal costs are the first ones to be brought on line to meet demand and the plants with the highest marginal costs are the last to be brought on line.
Project boundary	A project boundary encompasses all anthropogenic emissions by sources of GHG, or geographically delineates an afforestation or reforestation project, under the control of the project participants that are significant and reasonably attributable to the project.
Reforestation	"Reforestation" is the direct human-induced conversion of non-forested land to forested land through planting, seeding and/or the human-induced promotion of natural seed sources, on land that was forested but that has been converted to non-forested land. For the first commitment period, reforestation activities will be limited to reforestation occurring on those lands that did not contain forest on 31 December 1989.
Renewable energy	Energy that comes from natural resources such as sunlight, wind, rain, tides, and geothermal heat, which are renewable (naturally replenished).
Retrofit	To modify existing facilities (e.g. manufacturing facility) which are already in service using new, improved or more efficient parts and equipment developed or made available after the time of original manufacture or installation of the facility.
Sectoral scope	The CDM Accreditation Panel adopted a list of sectoral scopes, which is based on the list of sectors and sources contained in Annex A of the Kyoto Protocol. At the same time a sectoral scope(s) of accreditation sets the limits for work which a DOE may perform under the CDM with regard to validation as well as verification and certification related to identified sector(s). A full list of sectoral scopes, related methodolgies and DOEs is available at: <https://cdm.unfccc.int/DOE/scopes.html#11>
Waste energy	A by-product gas/heat/pressure from machines and industrial processes having potential to provide usable energy, which is currently wasted. For example gas flared or released into the atmosphere, the heat or pressure not recovered (therefore wasted).

SPECIFIC GLOSSARY TO A/R METHODOLOGIES

Above-ground biomass [6]	All living biomass above the soil including stem, stump, branches, bark, seeds, and foliage as well as herbaceous vegetation.
Agroforestry	Growing of both trees and agricultural / horticultural crops on the same piece of land.
Allometric biomass equations	Regression equations calculating biomass based on measured parameters of a tree (or shrub). E.g. quantifying the relationship between above-ground tree biomass and the diameter at breast height and tree height of a specific tree species.
Below-ground biomass [6]	All living biomass of roots. Fine roots of less than (suggested) 2 mm diameter are often excluded because these often cannot be distinguished empirically from soil organic matter or litter.
Biomass expansion factor	Ratio of total stand biomass to stand (merchantable) volume (e.g. as derived from forest yield tables).
Deadwood [6]	Includes all non-living woody biomass not contained in the litter, either standing, lying on the ground, or in the soil. Dead wood includes wood lying on the surface, dead roots, and stumps larger than or equal to 10 cm in diameter or any other diameter used by the country.
Degraded land	Land degradation is a long-term decline in ecosystem function and productivity and measured in terms of net primary productivity. All forms of land degradation will ultimately lead to a reduction of soil fertility and productivity. The general effect is reduced plant growth, which in turn causes loss of protective soil cover and increased vulnerability of soil and vegetation to further degradation (e.g. erosion).
Forest	Under the CDM, "forests" consist of trees with a minimum height of between 2 – 5 m, minimum crown density between 10 – 30 %, and a minimum area between 0.05 – 1 ha. Countries must choose values for these parameters and determine a minimum width of a "forest".
Harvesting	Cutting and removal of trees from forests for timber or other uses. In sustainable forestry, harvesting is followed by planting or natural regeneration of the forest.
Leakage	Increase in GHG emissions (or decrease in carbon accumulation) outside the boundary of an A/R CDM project activity which is measurable and attributable to the A/R CDM project activity, e.g. due to displacement of activities to areas outside the project boundary
Litter [6]	Includes all non-living biomass with a diameter less than a minimum diameter chosen by the country (for example 10 cm), lying dead, in various states of decomposition above the mineral or organic soil. This includes the litter, fumic, and humic layers. Live fine roots (of less than the suggested diameter limit for below-ground biomass) are included in litter where they cannot be distinguished from it empirically.
Non-forest woody vegetation	Woody vegetation which does not reach the threshold for forest definition, e.g. single trees and shrubs.
Non-tree woody vegetation	Shrubs and potentially small trees below a minimum diameter at breast height as defined by the country (e.g. 10 cm).
Polyculture	Agriculture system using multiple crops in the same area, rotating the different crops between the various land parcels.
Silvopastoral activities	Integration of trees with forage and livestock production (grazing) on forest land.
Soil organic carbon [6]	Includes organic carbon in mineral and organic soils (including peat) to a specified depth chosen by the country and applied consistently through the time series. Live fine roots (of less than the suggested diameter limit for below-ground biomass) are included with soil organic matter where they cannot be distinguished from it empirically.
Thinning	Selective removal of trees to reduce stand density and competition between trees in a stand, primarily undertaken to improve the growth rate or health of the remaining trees.
Wetland	Area of land whose soil is saturated with moisture either permanently or seasonally.

[6] According to Intergovernmental Panel on Climate Change Good Practice Guidance for Land Use, Land-Use Change and Forestry, table 3.2.1 on page 3.15